ISSN 0035-6751

INTERNATIONAL REVIEW OF ECONOMICS AND BUSINESS - Volume XXXVIII, n. 2 - February 1991

RIVISTA INTERNAZIONALE DI SCIENZE ECONOMICHE E COMMERCIALI

Anno XXXVIII Febbraio 1991 N. 2

Pubblicazione mensile - Sped. in abb. postale, gruppo III/70 Bologna

SOMMARIO

SOTTO GLI AUSPICI DELLA
UNIVERSITÀ COMMERCIALE LUIGI BOCCONI
E DELLA UNIVERSITÀ DEGLI STUDI DI MILANO

CEDAM - CASA EDITRICE DOTT. A. MILANI - PADOVA

Rivista Internazionale di Scienze Economiche e Commerciali
(International Review of Economics and Business)

Pubblicazione mensile (A monthly journal). Direzione e Redazione (Editorial Office): Via Teuliè 1, 20136 Milano (Italy), Tel. 02-89409031, C.c. postale 47300207.

Abbonamento 1991 (Subscription 1991): Italia (Italy), Lire 170.000; estero (abroad), Lire 220.000. Collezione completa rilegata 1954-1989, prezzo speciale (Whole bound set of back issues, 1954-1989, special offer price) Lire 1.630.000.

Condizioni di Abbonamento ai Periodici « Cedam »

L'abbonamento è annuo e si rinnova tacitamente per l'anno successivo se non viene disdetto entro il mese di dicembre, con lettera raccomandata. La semplice reiezione di fascicoli non può essere considerata come disdetta. Il canone di abbonamento deve essere pagato anticipatamente. In caso contrario la Casa si riserva la facoltà di interrompere l'invio dei fascicoli. I pagamenti devono essere effettuati direttamente alla Casa di Padova sul c/c postale n. 205351 oppure ai suoi incaricati muniti di speciale delega, che rilasceranno ricevuta sui moduli recanti il marchio Cedam e numerati progressivamente. Il rinnovo dell'abbonamento deve essere effettuato entro il 31 maggio di ogni anno. Trascorso tale termine l'amministrazione provvederà direttamente all'incasso mediante emissione di fattura con ricevuta bancaria. I fascicoli non pervenuti all'abbonato devono essere reclamati prima della conclusione dell'abbonamento in corso. Decorso tale termine saranno spediti, se disponibili, contro rimessa dell'importo. L'abbonamento importa, agli effetti legali, elezione di domicilio in Padova presso la Casa Editrice.

Direttore responsabile: Aldo Montesano - Autorizz. Tribunale di Treviso N. 113 del 22-10-54

Rivista associata all'Unione della Stampa Periodica Italiana

Tip. Leonelli - Villanova di Castenaso (Bo)

Rivista Internazionale di Scienze Economiche e Commerciali
Volume 38 (1991), N. 2, 97-100

DAL MANICHEISMO PUBBLICO/PRIVATO AL VERO MALE: LA BUROCRAZIA

di
ANNA PELLANDA *

Nel clima generale di sorpresa per quanto sta avvenendo da poco tempo ad Est dell'Europa e nell'affanno descrittivo/prescrittivo che infervora l'Ovest, le tentazioni manichee sembrano prevalere. In realtà bisognerebbe riconoscere che, a turno, tutti i sistemi economico-politici sono stati sottoposti a revisione. S'era cominciato già negli anni trenta con la critica al capitalismo tradizionale per le sue irrisolte ingiustizie distributive. Ora tocca al comunismo per le sue congenite incapacità produttive. Il primo, piú antico tipo di manicheismo risale a J.S. Mill, prima che a Marx, il cui merito è di aver contrapposto efficienza produttiva delle "leggi" dell'economia di mercato ad equità distributiva delle "forze" sociali e collettivistiche. Ma sulla descrizione analitica ha fatto premio, nel primo novecento, la prescrizione sociale tanto è vero che la ricetta per risolvere il binomio produzione tecnica/distribuzione giusta proposta da Marx con la rivoluzione è stata applicata nei paesi dell'Est del tutto dimentichi o ignari della lezione di Mill. A parte le ascendenze scientifiche, i risultati che oggigiorno sono sotto gli occhi di tutti indicano che i regimi comunisti sono allo sbando politico e alla bancarotta economica, quelli dell'Ovest (Stati Uniti esclusi) si sono imbastarditi delegando allo Stato monopoli, interferenze tariffarie, assistenzialismi vari, ma sopravvivono. Non vivono perché l'entità del debito pubblico li sta strangolando un po' ovunque e con particolare virulenza in Italia.

E sì che questi paesi, cosiddetti a economia mista, cercano d'uscire dal dilemma tra produzione "capitalistica" e distribuzione sociale consentendo alla proprietà pubblica d'affiancarsi alla privata, avvalendosi di una gestione imprenditoriale separata dalla proprietà e reclutata anche con criteri politico/amministrativi, ed interferendo con alcune tariffe e prezzi politici nella libertà dei consumatori e delle imprese. Questa via di mezzo potrebbe far quasi da modello sperimentale al "socialismo di mercato" se a questo regime si volessero convertire le economie dell'Est transfughe dall'economia di Stato. Suo prerequi-

* Università di Padova, Facoltà di Giurisprudenza, Padova.

sito è la grande impresa teorizzata e adottata per primi dagli americani e poi esportata in Europa sia per ragioni di sopravvivenza concorrenziale sia per motivazioni ideologiche. Le prime infatti non rispettano che vincoli di costi, con l'eccezione forse unica per l'artigianato, le seconde probabilmente ritengono che l'estensione dimensionale socializzi la finalità egoistica dell'impresa privata.

Ma questa via "di mezzo" non riesce ad assurgere a "terza" via: dal punto di vista reale e internazionale è snobbata dalle economie dell'Est che aspirano alla proprietà privata e alla piccola impresa; questo certamente avviene nella Germania ex-R.D.T. ove acquirenti anche stranieri di imprese statali vengono allettati con ogni sorta d'attrattiva e nell'U.R.S.S. ove l'ideale trasformista sembra essere la piccola impresa. Dal punto di vista sempre reale, ma interno, questa economia mista è invalidata dall'altissimo costo sociale dei deficit pubblici che innesca. I costi sostenuti per l'assistenza sanitaria, l'istruzione generalizzata, i trasporti, almeno in Italia, sono alle stelle e prima o poi ricadranno sui cittadini smentendo proprio quelle finalità sociali di equità distributiva che con essi ci si era date.

Se l'economia "di mezzo" e la grande impresa hanno avuto qualche merito, questo è teorico: hanno svanito l'incubo dell'identificazione del capitale con la proprietà privata. Alcuni sembravano infatti dimenticare che il capitale è fattore di produzione, quindi variabile regolata da "leggi" economiche (pur nella difficoltà della loro formulazione) e non un'istituzione ricadente sotto l'egida delle "forze" storico-sociali. In conseguenza hanno chiarito finalmente che motore principale del processo produttivo, sia di mercato che di Stato, è l'imprenditorialità non la proprietà. Quest'ultima, se privata, s'interessa al dividendo azionario; se pubblica alla quota redistribuita tra i soci di una cooperativa o tra gli obbligazionisti di un ente statale; ma non alla produzione, delegata appunto agli imprenditori. Questi, a loro volta, che nascano per eugenetica di marshalliana memoria o che si formino per qualificazione professionale, secondo l'esperienza delle grandi scuole francesi (politecnici), possono essere dei manager privati o dei direttori stipendiati dallo Stato. Basta sappiano dirigere, innovare, rischiare. Il che non è davvero poco; comunque non è appannaggio dell'imprenditorialità privata.

Se quindi il manicheismo teorico relativo al capitale è stato sfatato: l'abbaglio di un fattore di produzione scambiato per un'istituzione sociale può valere al massimo come connotazione storica di una determinata fase industriale, ma è un errore analitico. Se il manicheismo tra "privato capace" e "pubblico inefficiente" vien meno di fronte alla separazione tra proprietà e gestione e all'esistenza di ottimi dirigenti pubblici sia ad Ovest che ad Est. Se l'ingiustizia distributiva non caratterizza più solo i sistemi di mercato ma pervade anche quelli a economia mista e di Stato, niente essendo piú iniquo di un disastroso deficit pubblico. Se tutti questi raffronti su cui s'è dilaniata l'economia politica e la politica delle diverse economie risultano superati dalle teorie e dai fatti, come mai la scienza e la realtà economiche sono afflitte da crisi e mali incurabili? Ovviamente non si può generalizzare: i sistemi sia teorici che reali si

differenziano tra loro se non altro per distanze culturali e urgenze pratiche. La teoria della grande impresa di Marris, ad esempio, può essere in linea con quella di Berle e Means e tutte e tre, marcate U.S.A., dimenticare che i primi a distinguere tra proprietà (terriera) e conduzione di "fermiers" sono stati i Fisiocrati francesi (ma si sa che reinventare la ruota è – accademicamente – quasi più utile della ruota stessa). Così come all'Est, sotto l'affanno concreto e l'emergenza quotidiana, si cerca più il rimedio contingente che non la disamina teorica. Peccato però, perché un premio Nobel olandese, Tinbergen, è dal 1961 che ipotizza la convergenza tra sistemi collettivistici decentrabili e sistemi di mercato pianificabili, anche con rispetto all'indilazionabile problema ambientale.

Ma ognuno va per la sua strada salvo trovarsi accumunati dallo stesso male: esso pare diagnosticabile nella burocrazia che, come spiegava Pareto, "cristallizza" sia l'iniziativa privata che il privilegio sociale. A questa invadente organizzazione sembrano riconducibili le inefficienze dei paesi a economia di mercato e mista, vessati da pratiche amministrative affidate a un ceto impiegatizio improduttivo. Sempre alla burocrazia e al suo potentissimo ruolo vanno imputate le malversazioni cui sono sottoposte le popolazioni nei regimi a economia di Stato perché, lì, la burocrazia spartisce con il potere politico i privilegi di una nuova classe di sfruttatori.

Se la finalità sociale ha portato le economie dell'Ovest a delegare allo Stato la conduzione economica di alcuni rami di imprese e servizi, lo Stato a sua volta s'è dovuto servire del settore terziario per veicolare amministrativamente questa sua acquisita funzione economica. Ma il terziario pubblico in costante espansione, almeno in Italia malgrado recenti leggi e sbarramenti, è anche in perpetua incapacità di tenere il passo con i tempi tecnici e la produttività del terziario privato; forse è aiutato in ciò dalle risapute difficoltà della sua quantificazione produttiva in confronto agli altri settori, soprattutto al secondario. Questo consente alla burocrazia di perpetrare ai danni dell'intera macchina economica pesantissimi parassitismi che vanno ad aggiungersi e aggravare il deficit dello Stato, novello imprenditore.

Ad Est la burocrazia è fonte di danni produttivi e distributivi ancor più gravi date la lentezza e farraginosità delle sue procedure che pervadono ogni fase dell'applicazione dei piani. Finora, nei paesi comunisti, l'economia è stata del tutto centralizzata e i vari governi si sono avvalsi della burocrazia per l'esecuzione e il controllo di ogni direttiva di "programmazione globale dall'alto", dalle decisioni di investire a quelle di consumare. Se la burocrazia ad Ovest è responsabile di buona parte del deficit pubblico, ad Est la "nomenklatura" è incolpabile addirittura della fame cui alcune popolazioni sono state ridotte. Ad Ovest, incarnando la "cristallizzazione" dei processi produttivi e l'ineguaglianza retributiva, ad Est, rappresentando il braccio secolare del fallimentare potere politico, la burocrazia, ovunque, rende inattuabile l'ideale dell'efficienza economica e della giustizia sociale.

Se queste osservazioni sgorgano dal "pessimismo della ragione", altre

vorrebbero rispecchiare "l'ottimismo della volontà". Esse possono indicare una terapia per questo male comune nella ricerca di un canone di quantificazione, se non proprio di un'unità di misura, per le retribuzioni del terziario nell'estrapolazione di una media europea dei compensi orari per la pubblica amministrazione. Per quanto riguarda la produttività dei burocrati, il ricorso alla teoria menegeriana della "perdita" potrebbe mettere in luce di quanto si depaupera un servizio (prodotto) se vengono via via meno delle componenti del suo svolgimento (produzione). Da un punto di vista amministrativo, forse il decentramento, miraggio o paura a seconda della prospettiva da cui lo si guarda, può fornire valide motivazioni di riorganizzazione. Qualcosa comunque bisogna fare perché non basta chiedersi "che fare?".

FROM GOOD AND EVIL, ALIAS PRIVATE AND PUBLIC, TO THE REAL ILLNESS: BUREAUCRACY

The end of the planned economies of Eastern Europe raises the temptation of abscribing all the good to capitalism and all the evil to communism. Nevertheless pure capitalism has been under criticism since the 1930's and is now more or less substituted by the mixed economy. This system is similar to "market socialism". But, apart from differences among countries, all systems seem to suffer from a common illness: bureaucracy.

In Western countries bureaucracy administers the State intervention in the economy, feeding an unproductive tertiary sector which increases public deficit and hampers social justice. In Eastern countries the "nomenklatura" is responsible even for leading people to starve being the "secular arm" of dictatorial political powers.

The "medicines" proposed are 1) a European average perhour salary for public employees, 2) the "loss" principle applied – gradually – to civil servants and 3) decentralized administrative organizations.

Rivista Internazionale di Scienze Economiche e Commerciali
Volume 38 (1991), N. 2, 101-112

THE RHETORIC AND SUBSTANCE OF BASIC NEEDS

by
PANAYIOTIS C. AFXENTIOU *

1. *Introduction*

Income distribution has always commanded high priority in the value system of economists and other social thinkers. Only in times of continued prosperity in the industrialized countries does it lose part of its emotional appeal. For the rest of the time and more noticeably in the poor than in the rich countries, it is hotly debated and analyzed in the context of public interest as an important factor of social cohesion and integration. Interest in income distribution flourished in the post World War II period after it was established that the poorest 20 to 40 per cent of people in developing countries hardly participated at all in the benefits of economic growth. Based on the record of this period some argued that not only relative poverty increased but absolute poverty as well (Adelman, 1975). Others demonstrated convincingly that the case of increased absolute poverty was not supported by data (Lal, 1976; Ahluwalia, 1976), but the fact remained that the vicious circle of poverty in the Third World was not broken; in fact, it was not even dented.

The diminished faith in the tricle down process of economic growth prompted a search for a re-orientation of economic development. Such a re-orientation was felt to be dictated by the unsuitability of per capita GNP to serve either as a proxy for development or as an index of social welfare (Seers, 1969; 1972). The emphasis shifted from growth of GNP to reductions in poverty, unemployment and income inequality, and world-wide concerted action was officially advocated by the International Labour Organization (ILO) at the 1976 World Employment Conference aiming at reshaping the international order through policies that made the satisfaction of

* University of Calgary, Department of Economics, Calgary, Alberta (Canada).

basic needs of the poor the central focus for national and international efforts (Ghai, 1977, p. 9).

At approximately the same time that ILO was endorsing basic needs, the World Bank, under Robert McNamara, was adopting similar, but more conservative policies developed by its staff (Chenery et al., 1974) that stressed poverty minimization instead of growth maximization [1].

After Seers (1969), who defined the aim of development as the "realization of the potential of human personality", enthusiasm for basic needs spread quickly because their satisfaction was seen as the only route toward such a realization. This enthusiasm resulted in extensive discussions which despite the noble intentions of the participants have not yet produced a strong theoretical edifice.

The purpose of this paper is to examine the theoretical weaknesses of basic needs. In doing so, the nature of basic needs is analyzed in section two, followed by their measurement in section three. Their possible trade-off with growth is covered in section four; the evaluation of their theoretical structure is undertaken in section five, while the last section is reserved for conclusions.

2. *The Nature of Basic Needs*

Fundamentally basic needs are a resource allocation issue, which, in the policy field, is inextricably associated with some degree of paternalism. As an allocation issue it is definitely not new. What is new is the recent intensive interest in it that has its roots in the global dimension of poverty and the serious consequences which are likely to follow from future disruptive social unrest that is constantly incited by unacceptable disparities in income and wealth distributions. In its pure allocative form it may be seen as representing the consumption behaviour of a rational low income household. In this spirit, Plato over two thousand years ago referred to the issue stating that "... the first and chief of our needs is the provision of food for existence and life. The second is housing and the third is raiment and that sort of thing" [2].

Implicit in basic needs is the existence of a system of hierarchical classification of wants which by necessity reflects a scale of relative values. However, this system can never be universally acceptable for policy pur-

[1] The close relationship between basic needs and the policies of the World Bank toward absolute poverty are discussed by AYRES (1983, esp. pp. 76-91).

[2] This quotation from Plato's Republic is taken from GEORGESCU-ROEGEN (1954).

poses owing to its value-laden structure. At best what may be expected from such a system is that some wants, which are considered to constitute the core of basic needs, are likely to be up to a certain rank hierarchically identical for all people (Georgescu-Roegen, 1954). Undoubtedly what constitutes this core is not easily defined, nor is its satisfaction unambiguously determined. Apparently, even in the unlikely event of an agreement as to the core of basic needs, there will always be disagreements as to the optimal way of their satisfaction that arise from differences in cultures and resource availability among regions and countries. Naturally these disagreements increase exponentially when the entire system of wants is subjected to international comparisons.

Classifications of wants that represent nothing more than definitional exercises are intellectually permissible. The schemes developed by Maslow (1970) in the form of a pyramid and by Streeten and Burki (1978) fall under this category. There are close similarities between these two normative schemes, but also striking differences regarding the nature of basic needs. Maslow claims that basic needs are human rights whose enforcement is unquestionable, whereas Streeten (1980) discards this claimed attribute due to resource scarcity and the necessity of interpersonal and intertemporal choices it imposes.

As for paternalism, it results from the requirement for supply management through which the objectives of basic needs are attained. Because basic needs policies are initiated in response to the failure of market forces to distribute equitably the benefits of growth, their implementation is a clear manifestation of government intervention to rearrange social priorities and to restructure production accordingly. This intervention extends beyond material needs to non-material organizational and institutional changes that inexorably lead to a relative increase in the size of the public sector (Lee, 1977). The general understanding from the literature is that the amount of resources allocated to the satisfaction of material basic needs would overwhelm that allocated to non-material, but as development continues a shift toward the latter should be expected, particularly in view of the broad objective of the recommended policies which according to Streeten (1979) "... is to provide opportunities for the full physical, mental and social development of the individual". This ideal objective, which actually paraphrases Seer's definition of development, appears to be unrealistic even for the rich countries. The attainment of this goal requires resources that are beyond the wildest dreams of governments in the Third World. An extreme interpretation would conclude that there is really no limit to what governments can do

in the pursuit of such a goal. In the name of basic needs a total socialization of resources is therefore not unthinkable.

It is imperative to avoid the implications of such an extremity, and to narrow the domain of basic needs to realistic proportions. An attempt in this direction was made by Friedman (1979) who distinguished wants from needs and considered the former as unlimited and private and the latter as finite and public. According to Friedman basic needs are communally identified rather than being truly public whereby indiscriminate benefits are conferred equally to all people. And, since there is no restraint as to what a community dominated by the poor can determine as public, basic needs are transformed into an open category ready to absorb whatever quantities of resources are allocated to it.

As a concept basic needs defy precise definition, a fact which is further complicated by their dynamic nature. In this they somehow resemble the classical idea of subsistence, which according to Adam Smith and David Ricardo was influenced by habits and customs. But, whereas subsistence represented a wage rate that secured population stability [3], basic needs are not limited to bare survival nor are they satisfied by a wage rate. They are certainly more ambitious than subsistence, and they refer both to the supply of concrete goods and services and the provision of intangible benefits and institutional changes that contribute to the development of the various dimensions of the human potential. Because of vagueness and imprecision, neither concept satisfies the strict scientific criteria of methodology. Nor has the extension of basic needs to entitlements by Sen (1983) lessened their theoretical weaknesses.

3. *The Measurement of Basic Needs*

A large number of social indicators is now regularly published, partly in reaction to the weaknesses of per capita income and partly in order to offer a richer perspective of the development process. The misleading picture given by such an average as the per capita income is not necessarily cleared by the availability of so many social indicators. A lot of them being averages inadvertently conceal information regarding distribution. From the policy point of view indicators show where a country is at a particular point in time, and the progress it makes through time. For them to be useful

[3] Ricardo (1962) referred to the wage rate as the natural price of labour that was "necessary to enable the labourers, one with another to subsist and to perpetuate their race, without either increase or diminution".

guides to basic needs policies, these policies must be precisely stated and the results accurately monitored, measured, and evaluated. Based on these criteria, indicators are found to be deficient.

In the first place, social indicators, which as a rule relate to both poverty and riches, frequently fail to distinguish between inputs and outputs. They do furnish information on a variety of concerns, but do not offer any systematic association among them in terms of causality or production functions. Correctly there is a tendency to emphasize mostly indicators representing outputs rather than inputs, but this does not solve the absence of true theoretical association between them and the strategic factors of the development process.

Secondly, because the information provided by the plethora of indicators is diffused and relatively unmanageable, researchers tend to concentrate on as few of them as possible, preferably on a single one, which encapsulates a number of influences from diverse areas of basic needs. Among the commonly employed in this respect are life expectancy at birth [4] (Hicks, 1979; Hicks and Streeten, 1980), the rate of infant mortality (Goldstein, 1985), and literacy rate (Hicks, 1982). However, the selection of these indicators is generally decided by statistical rules, not by theoretical soundness [5].

Thirdly, composite indices are also devised and depicted as more representative of basic needs than single indicators. Well-known in this regard is the Physical Quality of Life Index (PQLI) developed by the Overseas Development Council consisting of three components that are given equal weight, namely, life expectancy, infant mortality rate and literacy rate. There is little to recommend such indicators owing to the arbitrariness involved in the selection of variables and their individual weights. Furthermore, composite indicators are undermined by the scaling problem of the variables included. Scaling the percentage shortfall of variables from an expected level in a non-linear way as suggested by Sen (1981) may be valid for some, but not for all basic needs indicators. Because of these serious defects, with some justification, Bayless and Bayless (1982) stressed that the commonly used composite indices really "add nothing to our knowledge and strain the credibility of all social indicators research".

More fundamental to the weaknesses of these indicators than their questionable statistical properties is whether they are indeed superior to per

---

[4] A variant of life expectancy that assigns weights to ages at death was developed by SILBER (1983) under the name Equivalent Length of Life (ELL).

[5] An example of reliance on statistical techniques is the attempt of RAM (1982) to compress as many indicators into one through the method of principal components.

capita income as proxies for economic development. More specifically, the question to be asked is: "What do these basic needs indices represent?" Methodologically, measurement follows the definition of a concept, and until a concept is precisely defined the question of its measurement does not arise [6]. Basic needs have certainly not yet been unambiguously defined, and in the absence of a universally acceptable definition, their measurements remain suspect and unconvincing.

4. *Basic Needs and Growth*

The existence or not of a trade-off between basic needs and growth is crucial in deciding the legitimacy of the former and in evaluating their welfare consequences. As direct anti-poverty instruments whose major component virtually consists of consumption, basic needs spending is seen to be at the expense of potential capital investment. Thus, a *prima facie* case for a trade-off looks inevitable (Little, 1982). The case against a trade-off is predicated on expected improvements in productivity of the poor, not only because their level of energy is raised due to increases in their calorie intake (Leibenstein, 1957), but also due to the human investment component of expenditure on education and health.

Intuitively the probability for a trade-off increases whenever the expenditure on education and health, owing to universal coverage, is spread too thinly to generate significant productivity benefits. Increased spending on basic needs may, however, prove to be at the expense of current rather than capital expenditure, in which case there need not be any statistically significant trade-off. Of course, in the absence of a substitution of basic needs spending for current government expenditure, a positive correlation between basic needs and per capita income should be expected because according to the principles of national income accounting, *ceteris paribus*, the expansion of basic needs expenditures plus their multiplier effects impact positively on GNP. And, more often than not, it is this positive relationship that one should normally anticipate statistically. In principle there is therefore no *a priori* reason to expect a unique relationship between basic needs and growth. Empirical studies tend to confirm this inference. According to Isenman (1980) basic needs have a deleterious effect on growth, whereas, according to Hicks (1979) the two are positively related. The findings of

[6] The most prevalent view is that basic needs are country-specific, not universal (Burki and Ul Hag, 1981), a fact that violates the rules of uniformity that contribute to reliable scientific hypotheses.

Sheehan and Hopkins (1979) were corroborated by Burki and Ul Hag (1981), who found that neither the level of income nor its distribution were important determinants of basic needs, and concluded that the low-income societies can meet their more pressing needs without sacrificing their growth. Goldstein (1985) found a non-linear relationship between the satisfaction of basic needs represented by the infant mortality rate and per capita income which indicated that after a certain limit increases in per capita income did not affect the provision of basic needs. Ram (1985) found that GDP was an important determinant of basic needs in low-income developing countries, but not in medium-income developing countries, whereas, income distribution was statistically insignificant in both groups.

The inconclusiveness of the statistical results is not surprising. The proof of a trade-off would have been difficult to defend anyway, because it would depend on a not-totally-convincing comparison of what would the GNP growth of a country be without the expansion of basic needs expenditure or on assigning an inordinately large importance to this expenditure in comparisons among countries. This observation should not, however, detract from the fact that the case for basic needs is promulgated by the failure of growth to alleviate widespread poverty. Nor should one overlook the fact that a direct attack on poverty under the umbrella of basic needs does produce quick benefits which without government intervention would take a much longer period of time to reach the poor. This clearly suggests that basic needs should be treated as ends in themselves, as socially and morally desirable, rather than being camouflaged as questionable means to certain ends [7].

5. *Evaluation of Basic Needs*

The popularity of basic needs can be traced to the welfare deficiencies of per capita income and the limited progress made in the alleviation of poverty in most parts of the world. Per capita income despite its comprehensive nature, is basically a uni-dimensional indicator of economic activity. A better picture of people's well being requires more information, similar to that provided by social indicators. These indicators are often correlated with per capita income, because, in the context of national accounting, part of the

[7] The allusion here is to the claim that the few extra resources that developing countries would allocate to education and health would reduce population growth (STREETEN, 1984, pp. 976-77), and to the assertion that basic needs promote democracy because their formulation and implementation call for popular participation of the poor (SZAL, 1979).

latter consists of contributions made by the former. Differences in correlation are inevitable because each social indicator does not necessarily follow the same path of per capita income during the structural transformations of economies.

If economic and social indicators are organically interdependent, or more strongly if economic indicators are uniquely determined by social indicators, then manipulation of the latter would be desirable not only as ends in themselves, but also as means to other ends. If such organic relationships existed, they would be stable and self-adjusting, exhibiting bi-directional causality, and would be captured by input-output techniques. Furthermore, if substitutability among social indicators is assumed, then governments would enjoy some degree of flexibility in assigning priorities in their social programs, which would directly help the poor. This substitutability is at the center of basic needs policies. But, in addition to it, a generous expansion of all social expenditures is also advocated.

A rigid organic structure, based on the premise that all constituent parts of a system, like organs in the human body, are perfectly co-ordinated and perform their specialized functions automatically and mechanically, is anathema to basic needs. This dismal prospect is derived from the property of such systems to disallow substitutability in functions and to render useless piecemeal interventions. Only interventions that affect each and every part of the system in a structurally unifying manner are permissible. And, to safeguard against wasteful use of resources, interventions must be balanced, a premise that underlies the development theory of balanced growth, which in its most ambitious version is formalized in the hypothesis of the "big push". However, the limited resources available to governments in developing countries stand out against such grandiose interventionist plans.

A justification for basic needs expenditures is possible, under an organic structure, if these expenditures are seen as the *primum mobile*, the prime mover, necessary for the activation of the latent forces of growth in the course of economic and social restructuring. Whether basic needs expenditures really possess such attributes or not is a matter to be decided empirically. However, a careful examination of the literature shows that their advocacy is not motivated by arguments invoking *primum mobile* characteristics, but rather is rooted mainly in concerns evoking humanitarian considerations.

The organic conceptualization of economies is at the heart of equilibrium analysis, which is intellectually appealing because of its simplicity. But, its mechanistic nature gives it an aura of unrealism, which is unacceptable to those who view economic development as an evolutionary process

(Boulding, 1981). In terms of evolution, basic needs represent a random shock introduced to enhance human dignity and accelerate the realization of the human potential. Basic needs then become a goal to which the evolutionary socio-economic forces are expected to adjust in time. In this framework basic needs are manifestations of a new mentality toward poverty whose alleviation must be sought globally and imaginatively.

6. *Conclusions*

Advances in science have intensified people's concerns for issues that impact on planet earth. One such issue with global dimensions is the issue of poverty that threatens, if unattended, to tear the social world fabric and create tensions among classes and countries. The structure of asset ownership together with its concomitant economic and political power led to more inequality of income and wealth and prevented the poor from benefiting from growth. The outcry against these offensive disparities was heard in the halls of power and in international organizations, and the advocates of re-orientation of economic development that was designed to deal more directly with poverty gave it the name of basic needs.

In the spirit of exhaltation which often accompanies the promotion of ideas, basic needs became a slogan of action, and in their enthusiasm some referred to them as a new theory of economic development while others treated basic needs more modestly as a new approach to such a theory. Neither of these characterizations reflects realistically the essence of basic needs. Despite the stimulus given to research, basic needs do not represent a well-defined body of knowledge or thought to qualify as a theory because they do not constitute a structure of interrelated diverse forces which converge into a system of testable hypotheses in the sphere of development economics. Similarly, they do not qualify as a new approach to development because they are not theoretically equivalent to other hypotheses of development economics in the sense of leading to measurable results that are comparable to those derived from traditional economic development thought.

Contrary to the rhetoric of their advocates, the theoretical foundations of basic needs are shaky. Basic needs are nothing more than an income redistribution plan in favour of the poor, who are targeted to receive early the benefits of development instead of waiting a lot longer until the fruits of economic betterment tricle down to them. What at best basic needs policies are likely to produce are certain development benefits whose probability of occurrence is difficult to estimate in advance, and which fall under the

category of externalities. Nobody disputes the beneficial effects of positive externalities, but they cannot form the core of development theorizing. Theories require something more concrete and substantive to be built on than the elusiveness of externalities. One may not agree that economists invoke the importance of externalities whenever economic analysis breaks down, yet one could convincingly argue that externalities often take the place of the unspoken hopes and prayers of analysts. Apparently, this happens more so in the literature of basic needs than in the theories of economic development.

REFERENCES

ADELMAN I., "Development Economics: A Reassessment of Goals", *American Economic Review*, May 1975, *65*, 302-309.

AHLUWALIA M.S., "Inequality, Poverty and Development", *Journal of Development Economics*, 1976, *3*, 307-42.

AYRES R.L., *Banking on the Poor: The World Bank and Rural Poverty*, Cambridge, Mass.: The MIT Press, 1983.

BAYLESS M. and BAYLESS S., "Quality of Life Indicators: Some Theoretical and Methodological Concerns", *American Journal of Economics and Sociology*, 1982, *41*, 421-37.

BOULDING K., "Agricultural Economics in an Evolutionary Perspective", *American Journal of Agricultural Economics*, 1981, *64*, 788-95.

BURKI J.S. and UL HAG M., "Meeting Basic Needs: An Overview", *World Development*, 1981, *9*, 167-82.

CHENERY H., AHLUWALIA M.S., BELL C.K.G., DULOY J.H. and JOLLY R., *Redistribution With Growth*, London: Oxford University Press, 1974.

FRIEDMAN J., "Basic Needs, Agropolitan Development, and Planning from Below", *World Development*, 1979, *7*, 607-13.

GEORGESCU-ROEGEN N., "Choice Expectations and Measurability", *Quarterly Journal of Economics*, 1954, *68*, esp. 510-18.

GHAI D.P., "What is the Basic Needs Approach to Development All About", *The Basic Needs Approach to Development: Some Issues Regarding Concepts and Methodology*, Geneva: International Labour Office, 1977.

GOLDSTEIN J.S., "Basic Human Needs: The Plateau Curve", *World Development*, 1985, *13*, 595-609.

HICKS N., "Growth vs. Basic Needs: Is There a Trade-off?", *World Development*, 1979, *7*, 985-94.

——, "Sector Priorities in Meeting Basic Needs: Some Statistical Evidence", *World Development*, 1982, *10*, 489-99.

—— and STREETEN P., "Indicators of Development: The Search for a Basic Needs Yardstick", *World Development*, 1980, *8*, 237-58.

ISENMAN P., "Basic Needs: The Case of Sri Lanka", *World Development*, 1980, *8*, 237-58.

LAL D., "Distribution and Development: A Review Article", *World Development*, 1976, *4*, 725-38.

LEE E.L., "Some Normative Aspects of Basic Needs Strategy", *The Basic Needs Approach to Development: Some Issues Regarding Concepts and Methodology*, Geneva: International Labour Office, 1977.

LEIBENSTEIN H., *Economic Backwardness and Economic Growth: Studies in the Theory of Economic Development*, New York: Wiley, 1957.

LITTLE I.M.D., *Economic Development: Theory, Policy and International Relations*, New York: Basic Books, 1982.

MASLOW A., *Motivation and Personality*, 2nd Edition, London: Harper and Row, 1970.

RAM R., "Composite Indices of Physical Quality of Life, Basic Needs Fulfillment, and Income: A 'Principal Component' Representation", *Journal of Development Economics*, 1982, *11*, 227-47.

——, "The Role of Real Income Level and Income Distribution in Fulfilment of Basic Needs", *World Development*, 1985, *13*, 589-94.

RICARDO D., *The Principles of Political Economy and Taxation*, London: Dent, 1962.

SEERS D., "The Meaning of Development", *International Development Review*, 1969, *11*, 2-6.

——, "What Are We Trying to Measure", *Journal of Development Studies*, 1972, *8*, 21-36.

SEN A., "Development: Which Way Now?", *Economic Journal*, 1983, *93*, 745-62.

——, "Public Action and the Quality of Life in Developing Countries", *Oxford Bulletin of Economics and Statistics*, 1981, *43*, 287-319.

SHEEHAN G. and HOPKINS M., *Basic Needs Performance*, Geneva: International Labour Office, 1979.

SILBER J., "ELL (The Equivalent Length of Life) or Another Attempt at Measuring Development", *World Development*, 1983, *11*, 21-29.

STREETEN P.P., "Basic Needs: Premises and Promises", *Journal of Policy Modeling*, 1979, *1*, 136-46.

——, "Basic Needs and Human Rights", *World Development*, 1980, *8*, 107-11.

——, "Basic Needs: Some Unsettled Questions", *World Development*, 1984, *12*, 973-78.

—— and BURKI S.J., "Basic Needs: Some Issues", *World Development*, 1978, *6*, 411-21

SZAL R. J., "Popular Participation, Employment and the Fulfillment of Basic Needs", *International Labour Review*, 1979, 27-38.

RETORICA E SOSTANZA DEI BISOGNI FONDAMENTALI

Il movimento per i bisogni fondamentali nacque come reazione ai risultati delle forze di mercato, che escludevano in grande misura i poveri dai vantaggi dello sviluppo economico. Spaventati dalle crescenti disuguaglianze nella distribuzione del reddito e della ricchezza, i sostenitori dei bisogni fondamentali richiesero politiche che alleviassero la povertà e promuovessero la piena potenzialità individuale. Le difficoltà inerenti alla definizione dei bisogni fondamentali ne ostacolano una accurata misurazione e impediscono una chiara messa a fuoco della pianificazione e intervento pubblico. Ogni sforzo per dare sostanza teorica ai bisogni fondamentali sembra inefficace. Da un esame delle questioni relative a questo problema emerge che i bisogni fondamentali risultano essere una meta lodevole anziché una nuova teoria di sviluppo economico o un nuovo approccio alla teoria dello sviluppo.

Rivista Internazionale di Scienze Economiche e Commerciali
Volume 38 (1991), N. 2, 113-131

SOME REMARKS ON THE NOTION OF "REVEALING" RATIONAL EXPECTATIONS EQUILIBRIA

by
PIER LUIGI SACCO *

1. *Introduction: Rational Expectations as a Positive Theory of Information Transmission?*

The influential work by Grossman (1981) is rightly considered one of the cornerstones of the literature on the existence of rational expectations equilibria (R.E.) under asymmetric information. As a matter of fact, since its origins (that can be traced back as far as Radner, 1968), this literature has developed on the groundwork of the temporary equilibrium model with perfect foresight (TEPF), whose formalism has clear analogies with the Arrow-Debreu's model of intertemporal equilibrium, from which, however, it differs deeply as to the way the decisional problem of economic agents is modeled (see Donzelli, 1986a, ch. 9) [1].

One troubling characteristic of models in the TEPF tradition is that of endowing individuals with knowledge of the structural chracteristics of the

* Università Bocconi, Istituto di Economia Politica, Milan and European University Institute, Florence.

I thank professor Aldo Montesano for his extensive and insightful comments on an earlier draft. I further thank Sandro Brusco, Pier Mario Pacini and Roberto Tamborini for useful talks about some of the issues discussed here. Finally, I thank Adriana Anderboni Papini for her skilful and accurate revision of the English text. The usual disclaimer fully applies.

[1] As clearly shown by DONZELLI (1986b), the literature often misinterprets the important substantial differences existing between Arrow-Debreu and TEPF models, so that optimal programs with perfect foresight are sometimes referred to, under the assumption of complete markets, as 'Arrow-Debreu programs' (see e.g. TOWNSEND, 1987). Even from a purely terminological point of view there should not have been any room for ambiguity. TEPF models are temporary equilibrium models in the Hicksian tradition, in which decisions can be revised from time to time, while Arrow-Debreu's is an intertemporal equilibrium model in which all decisions are made, once and for all, at the beginning of time. For an extensive analysis of the temporary equilibrium structure of TEPF models, see SACCO (1989b). In what follows we will try to avoid incorrect terminology.

economic system without explaining how they can ever come to acquire it. This procedure allows the model maker to prove the existence of equilibrium for the economy he has built. However, it is highly doubtful when such a model must be meant as an idealized picture of the working of actual economic systems. In fact, 'rational' individual behavior conditioned by substantial knowledge of the structural characteristics of the economy is qualitatively very different from the kind of 'rational' behavior that emerges as a solution of real-life decisional problems.

In particular, the model of rational behavior based on the aprioristic knowledge of structural characteristics is thought to be *universally* applicable: it holds in all environments and situations or more simply its definition does not exploit, but instead tends to *explain*, some particular characteristics of the environment under consideration (see e.g. Townsend, 1988). Whereas one striking distinctive feature of real-life decisional problems, as cognitive science depicts them, is their strong degree of context-sensitivity: real life 'rational' behavior seems to be an adaptive, gradual elaboration of networks of procedural routines for a broad range of different but specific environmental stimuli rather than an application of an aprioristic rule based on some sort of prescience of the environment itself. Moreover, it is very misleading to think of the latter mode of behavior as a limit outcome of the former, that is, to think that an adaptive network-maker will eventually become an 'aprioristic' rational individual when he comes to know his environment well enough [2]. This false belief is based on the misconception that a rational mind would inexorably cast his information about the environment into something like a 'mathematical' model of it. As a consequence, the common preconception that models with substantial structural knowledge can be thought of as a crude idealization of reality is simply wrong: even if endowed with more computational abilities and more information, individuals would not form their expectations in the way TEPF models predict they would do.

A 'mathematical' model is a logical construction whose reliability entirely lies in the belief of its *correctness*. As soon as the existence of some inconsistency in it can be proved, it loses any cognitive value as such. Mental networks, instead, are designed to *preserve* meaning and reliability of stored knowledge as much as possible; so while the degree of fragility toward potential inconsistencies generated from new incoming information is maximum in the former case, it tends to be minimum in the latter (compare Minsky, 1986, sec. 18.8). This profound qualitative difference

[2] Obliged reference here is MINSKY (1986).

between these cognitive procedures leads to believe that the preservative aspect of mental networks is likely to be *strengthened*, rather than weakened, as the environment becomes more and more familiar to the individual.

Even from a normative viewpoint, the aprioristic approach fails, because it offers us no clue as to how one should act in every particular situation, more specifically how one should behave to be 'rational' when the representation of the decisional problem is in some sense troublesome – in other words, it lacks operational content [3].

This state of things reflects the way in which the emergence of equilibrium is characterized within the TEPF tradition (compare Radner, 1972). The ultimate upshot of the TEPF approach almost entirely lies in the various versions of the proof of existence, typically achieved through (non-constructive) fixed point arguments according to the tradition of general equilibrium literature sprinkling from the *Mathematisches Kolloquium* of Von Neumann, Karl Menger, Abraham Wald etc., and, again, in the wake of Debreu (1959). From a strictly logical point of view, a fixed-point kind of proof demonstrates that the assumption of the existence of equilibrium is not in constrast with the axioms of which the underlying model is made up. However it fails to demonstrate that an equilibrium *actually* exists, for such proofs provide no information about what the effective characteristics of the equilibrium position are, let alone how it can be achieved.

The fact emerges with particular evidence when the model is used to deal with dynamic phenomena, and most notably in its rational expectations version. Grossman (1981, p. 545) emphasizes that "In a R.E. equilibrium ... traders need only know the stochastic process generating equilibrium price. Though the theory of market-clearing tells the *economist* about the underlying structural factors which determine price (such as the forms of the cost and demand functions), in equilibrium *traders* need not know anything about the structural form of the economy. They need only know the relationship between price and the stochastic factors that determine output. Of course, the theory does not explain how equilibrium comes about" (Grossman's emphasis).

This way of reasoning, largely shared in the literature, seems quite

[3] This means among other things that when his 'mathematical' model is falsified, the 'mathematical' decision maker has no guide in making decisions until he finds a satisfactory respecification for his model. This process could take time – and would make the choices he is forced to make during the transition from one model to another clearly suboptimal. In fact the refutation of the original model leads the individual to discard bits of information which would have been valuable to back up for decisions, but hardly exploitable in the absence of a clearly defined interpretative framework.

gratuitous. In particular, the splitting of perspective between the traders' and the economist's point of view clearly hides the fact that the emergence of equilibrium requires some sort of knowledge of the structural characteristics of the economy. In addition, unless one is ready to take the auctioneer's story for granted for its own sake, this knowledge must ultimately be traced back to individuals if they are properly to interpret the signals coming from the market during the adjustment process (compare Sacco, 1990). If in the Walrasian general equilibrium model this shortcoming is somewhat softened by the static nature of the model, in the R.E. case it amounts to miss the point completely.

R.E. conquered a prominent position in the economics of asymmetric information because they placed emphasis on the possible informational content of equilibrium prices, and on the fact that originally uninformed individuals might rationally take account of market signals to improve their welfare when choosing their equilibrium trades. As Grossman remarks, however, if this is to happen, at least the relationship between prices and states of the world (possibly realizations of some stochastic process) must be known in advance, even when, so to speak, the auctioneer is at work.

The aim of this paper is to explore more closely the shortcomings of the 'aprioristic' approach in the particular, and most representative, case of R.E. under asymmetric information. The fact that the way in which this stream of literature models the basic economic fact that prices may have an informational role in the market process is quite innatural both from a descriptive and a normative point of view will be highlighted. This of course doesn't mean that prices don't have an informational role in actual market processes. Rather, it means that *a*) R.E. models with asymmetric information add little to our comprehension of how this role is performed in real economic systems; *b*) our analyses of cognitive and decisional processes should abandon this modeling procedure; and *c*) we should draw more systematically from the parallel research going on in cognitive sciences.

2. *How 'Revelation' Comes About?* [4]

In the contingent-claim version of the TEPF model based on the

[4] Given our space limits a self-contained exposition is impossible here. The nonspecialist reader should consult GROSSMAN (1981) and ALLEN (1986) for example as references. It should be emphasized that the following sections do not introduce a fully closed model, but rather an interpretative framework of some characteristics shared by a number of different models in the literature.

formalism of Arrow-Debreu (compare Debreu, 1959, ch. 7, Radner, 1968), optimal trade plans are typically conditioned on alternative states of the world at any given moment. Knowledge of the state that occurs at a given period has consequences on one's well-being. Thus the first piece of structural knowledge people are endowed with concerns the list of all alternative states of the world at any time. If there are uninformed agents, i.e. people who are not able to observe the state of the world directly, they come to learn of it through the observation of market prices if they know the relationship existing between prices and states of the world. This is of course the second piece of structural knowledge people are required to possess. Finally, if prices must be informative, there must be a fictional trade process à la Walras so that, after having observed the revealing price vector, individuals are allowed to revise their demands accordingly, without being forced to execute their original, uninformed plans. However, if individuals have to accept the artificial no-trade-out-of-equilibrium conventions of the *tâtonnement* process, they must share some further knowledge of the structural characteristics of the economic system, notably, the aggregate excess demand function (see Saari and Simon, 1978, and also Sacco, 1990).

To restate all this a bit more technically, the existence of R.E. equilibria is proved starting from a 'master equation' obtained from the combination of individual optimization and market clearing. Since preferences are assumed to be state dependent, what follows is that the equilibrium price correspondence is generically dependent from the actual state of the world that occurs. Uninformed agents can observe prices but they don't know the actual state of the world that occurs, so they try to infer it from prices. As a consequence, the 'master equation' becomes a functional equation in $p = \phi(\theta)$, p being the price vector, and θ being the vector indexing states of the world:

$$H(\phi(\theta)) = 0 \qquad (1)$$

A 'revealing' R.E. equilibrium can be, roughly speaking, thought as the equilibrium manifold defined by (1). It is a correspondence defined by the equivalence class $\Phi^* = \{\phi^*\}$ of functions solving (1) so that, given a p_0 that locally solves (1), for a neighborhood $P_0 \subset \Delta$ of p_0, Δ being the unit price simplex, $\phi^{-1}(p)$ is a well defined function on P_0 (see Allen, 1986, for a compact exposition of technical details). This means that for each small subset of the price simplex, the θ vector is a 'good' indexation of prices through some $\phi^* \in \Phi^*$ and thus the uninformed agent can easily infer the actual state of the world that occurs from the observation of prices. Of course, the existence and the structure of 'revealing' equilibria depend on

relative dimensionalities of the price simplex Δ and of the set of the states of the world Θ. The actual and rather technical issues arising from this point are not of primary importance for our discussion, so the interested reader is referred to Allen (1986) for a survey, and to Sacco (1988) for a discussion of their meaning within the whole literature on R.E.

Two points must be made here. First, the above discussion suggests why Grossman's claim, cited in the introduction, according to which people need to know nothing about the characteristics of the economy for R.E. equilibrium to settle down is incorrect: if people know the relationship between market prices and states of the world, they can only have come to know it by solving equation (1) – hence they must know the structural characteristics of the system. Second, since the functional equation (1) has generally plenty of different, equally valid solutions, all people must pick the same solution, and this fact must be common knowledge, if the observation of market prices has to be revealing for the uninformed. This is a good example of the basic weakness of the 'aprioristic' approach: the model maker arbitrarily chooses the content of individual information sets in order to obtain the desired results. He can do it because current model-making practices do not require him to find a plausible story to motivate the choice: the standards of explanation that prevail today in the literature prescribe that the modeling of cognitive activities *should* be carried out in this way. But it may well be that this choice is inconsistent; that is, if people have to know what they know, they must in fact know more than they are supposed to, as in our case.

In conclusion, the equilibrium price manifold must be common knowledge among agents if 'revelation' must take place. We will return to this point in the next section. Before that, let's take for granted that such common knowledge is established and examine more closely how equilibrium comes about, a thing which proves to be worth while in order to gain further insight into the nature of R.E. equilibria.

At the beginning of the story we have both informed and uninformed traders. The former ones observe θ and thus know the equilibrium price $p^*(\theta)$ that will result given H. Consequently, they choose their equilibrium trades $x^*(\theta) \mid p^*$. The latter ones are ignorant about θ and thus their conjectures on prices and their trade plans are independent from θ. However, they know H and the corresponding price manifold as indexed by θ, and therefore they know what the eventual equilibrium prices will be for each state of the world. In other words, let $x_1^*(\theta)$ and x_2^0 be the original (notional) trades of informed and uninformed traders respectively and let H^0 be the corresponding master equation. Then the common knowledge assumption

means that *every* (viz., both the informed and the uninformed) agent in the economy knows Φ^0 that solves H^0, and thus for every observed p^0 they are able to pick up the 'relevant' $\phi^0 \in \phi^0$. Thus, if ϕ^0 displays sufficient variability in the corresponding P_0, or rather, if the observed price implies a unique $\theta \in \Theta$, the uninformed can infer it and can modify their equilibrium trades accordingly into $x_2^*(\theta)$. This brings about a change in the master equation, that turns into a new shape H^1, that is known as well by individuals *provided that it preserves bijectivity in the new equilibrium price function* ϕ^1. In fact, if this is not the case, being $p^1 = \phi^1(\theta)$ the eventual market price that is observed, individuals cannot learn the true state after all and, on the whole, the set of assumptions on individual knowledge is inconsistent.

Please note how this rather peculiar way of describing emergence of market equilibrium through 'revelation' of private information strangely depends on a multiple 'switch' of time flow. Individuals act *as if* they followed up on the whole notional process of trade plans and revisions thereof. However, what they actually observe is the eventual market price. Now, if this is not revealing, then the game breaks down. It could well be that a nonrevealing price is the limit outcome of a notional market process that, if observable, would be perfectly revealing. By supposing that individuals know Φ's, one then implicitly assumes that they know the consequences of their choices *before the choices themselves are made*, an apparent violation of the nature of 'epistemic' (viz., historical) time (compare Bausor, 1983, 1986). It is tempting to think that these discontinuities of the time flow are a by-product of the difficulty of finding an interpretation in terms of trade processes for the nonconstructive fixed point argument that underlies the proof of existence of equilibrium in the TEPF framework.

3. *What to Reveal?*

We now consider more closely the nature of the common knowledge assumption. As a matter of fact, recent research on the uniqueness of R.E. equilibria shows that there are lots of models in which H has multiple solutions, and thus the equilibrium price equivalence class is non unique. Several among the most classical models in the literature, such as the famous Lucas island model, are no exception to this (see e.g. Farmer and Woodford, 1984). In these cases, the common knowledge assumption on the equilibrium correspondence seems particularly strong. After all, if the learning process that leads to knowledge of Φ is not explicitated, one has no

particular reason to assume that individuals agree upon one particular solution rather than another.

Moreover, there is no reason to believe that individuals agree in the first place. In fact, one can imagine, under the same informational and cognitive hypotheses made in section 2, that there are two equilibrium price equivalence classes, Φ_i^0 and Φ_u^0, and that the informed and the uninformed stick to the former and to the latter, respectively. Thus, when a particular price is observed in a given neighborhood P_0, what can happen is that the corresponding ϕ_u^0 is 'revealing' and leads uninformed people to infer a state $\tilde{\theta}$ that is different from the one initially observed by the informed, say $\hat{\theta}$. But then what will almost surely happen is that the equilibrium price emerging after the uninformed have revised their trade plans according to their inference is different from the one expected by the informed according to ϕ_i^1 for the full information case. This happens because the full information equilibrium trade plan of the uninformed under ϕ_u^1, $x_2^*(\hat{\theta})$, is different from the plan $x_2^*(\hat{\theta})$ that would have resulted under ϕ_i^1. But this implies that the informed observe a price vector that is impossibile under ϕ_i^1, and this makes their conditional expected utility undefined (see Allen, 1986, p. 9).

Of course, the problem might become even more complicated when the individuals are aware of these instances and are ready to exploit them strategically. In this case, the structure of the problem could change abruptly, because agents could have the incentive to try to 'blind' each other by announcing trade plans that are inconsistent with the pieces of structural knowledge possessed by others. In other words, the implicit cooperative agreement on the rules defining the *tâtonnement* process would break down. What would happen then is entirely unexplored.

In TEPF models, at least two intra-period stages are needed to explain the emergence of equilibrium outcomes, and this feature provides individuals with a natural incentive to 'cheat' on their announced trade plans [5]. If this problem is taken into account, then a process of out of equilibrium expectations revision *must* be defined within the model if agents have to have a rational basis for their choices [6]. And thus far the importance of the specification of the learning process (in each of its distinct parts concerning

[5] Note that this remains true even with a unique equilibrium correspondence, if one admits that it may not be defined for some individual 'cheating' strategies. If instead people do not consider cheating on announced trade plans among their strategic possibilities, then at least two different equilibrium correspondences are needed to break down the 'revelation' argument.

[6] The emphasis on the role of modeling of out of equilibrium behavior as a necessary complement of any reasonable kind of equilibrium analysis is one of the main themes of Hahn's work, though the bearings of the issue have been misperceived by a large part of the literature for a long time. For a pioneering account, see HAHN (1984).

information acquisition and processing, respectively) as a fundamental stage of the model building procedure comes up once again. The assumption of common knowledge upon some particular solution appears in this case to be an entirely arbitrary selection on the equilibrium space. But then individual information sets cannot contain any arbitrarily chosen piece of structural information, as it is, for example, any predetermined list of 'market fundamentals'. It is the characteristics of the model environment that dictate what individuals can know in advance and what they can learn, *given what they observe*, and also what they cannot possibly know anyway.

Once arbitrary specification of individual information sets is not allowed, it becomes apparent that the 'aprioristic' approach can give no positive basis to the modelling of processes of information acquisition, processing, and even transmitting. Knowledge of structural characteristics of the system is an empty clause: it may be made valid in all possible model situations, if one likes, by simply assuming it, but it is never clear where one should stop and why, and what one has proved by choosing a particular configuration. An alternative, and perhaps more constructive, way of adding some degree of determinacy to the model is to give up universality and describe more accurately the peculiar characteristics of the model environment under study (such as the institutional setting, the nature and kind of shared knowledge, the observability conditions that create opportunities for informational asymmetries), and then to *derive* the content of individual information sets from these basic, model-specific hypotheses.

In conclusion, if the model maker wants to assume that people know some structural characteristics of the economy, he must be able to tell us how they can acquire such knowledge. But in doing so, he must tell a learning story that is completely specific to the model under question. In this light, the characterization of 'rational' behavior for the particular environment chosen is by necessity a story of the specific kind.

4. *Is There Something to Be Revealed?*

When out-of-equilibrium dynamics occur in historical time, the assumption of no trade out of equilibrium must evidently be dropped, and the master equation comes to depend on the historical sequence of trades (see e.g. Hahn, 1987, 1988), thus giving rise to a highly complicated behavior of the model for which a closed form solution is seldom obtained.

In spite of their unclear behavioral foundation, the assumptions concerning the agents' knowledge of the relevant structural features of the economy

may be justified at least as a means to keep the dynamics of the model at a tractable level. This is clearly an *escamotage*, because it is hard to assess the descriptive, and especially the normative value of a model in which determinacy of results is obtained at the cost of a complete change of the issue's nature. One can wonder if we really need clear answers to the wrong questions. But even so, it is worth considering what these clear answers are when one tries to characterize the revealing role of prices in R.E. equilibria.

In an important paper, whose relevance seems to be understated in the existing literature, Jordan (1982) provides in fact a complete characterization of the informational properties of rational expectations equilibria [7]. Once again we must remember that a revealing (rational) expectations equilibrium is a situation in which each individual has learned the true state of the economy through the observation of a sequence of market signals, viz. prices generated by individual fictional trade plans at each stage, and the plans thereof. A weakly revealing (rational) expectations equilibrium is a situation in which each individual has learned enough about the true state of the economy to be able to distinguish among all those couples (p,x) of competitive prices p and trade plans x that can be compared according to the weak axiom of revealed preference. In other words, in a weakly revealing expectational equilibrium, people must be able to make their trade plans as to avoid choices that are suboptimal with respect to every consistent preference ordering. Finally, an expectations equilibrium *tout court* is a situation in which market signals generate no new information, and thus people are not able to learn anything more from them.

A data structure is now defined by Jordan as an n-tuple of inference rules on observed market signals, one for each individual. A stochastic environment consists of an original information structure, a joint probability distribution on endowments and states of the world, and a well-behaved utility function for each individual. A data structure F is admissible if, for every possible stochastic environment, there exists a revealing (rational) expectations equilibrium. A data structure F is dynamically admissible if there is another data structure F^* which, for every possible stochastic environment, turns every expectation equilibrium for F into a revealing expectations equilibrium for F^*.

Jordan then proves that the only admissible data structures are the completely non-revealing and the completely revealing ones, that is, a (rational) expectations equilibrium can be brought about only if either people are not able to distinguish any state from another, or they are able to distinguish

[7] On this see also ALLEN (1986), section 8, and SACCO (1989b, section 5).

all possible states, in all possible settings. Furthermore, the only dynamically admissible data structures are again the completely non-revealing one and the weakly revealing one. In this latter case, if each individual is able to observe competitive prices and his own trade plan, every expectations equilibrium for the weakly revealing inference rules can be turned into a fully revealing equilibrium. These conditions are necessary and sufficient, and thus they fully characterize the structure of revealing (rational) expectations equilibria.

The completely non-informative case is clearly trivial, and will be left aside. What the Jordan results tell us is that prices do convey information about the true state of the world independently from the peculiar characteristics of the environment only if individuals are endowed with a sufficient (fairly high, in fact) degree of information as to the structural features of the economy – at least, enough to prevent them from making inconsistent choices given their preferences. This means that a non-revealing expectations equilibrium requires either dependence on the peculiar characteristics of the environment or inconsistent choices by one or more individuals in the economy. At any rate, the strict association between knowledge of structural features and the currently standard characterization of rational behavior is strikingly confirmed by these results: if one is ready to believe that models in the TEPF tradition are a theoretically reliable tool for the analysis of the performance of the competitive process one must also be ready to accept as a crucial assumption that people widely know about the structural characteristics of the economy.

There are some examples in the literature that explore the impact of model specification on the revealing role of prices (see e.g. Bray and Savin, 1986), and some others that study expectations equilibria when the possibility of suboptimal choices is admitted (see e.g. Heiner 1986a, 1986b). While the first stream of research stays entirely within the 'aprioristic' paradigm (changes in the environment are changes in the structural specification of the model and/or in the structural knowledge available to individuals), the second is more promising in that the notion of model 'environment' is meant in a broader sense, its concern being not only with individual tastes, beliefs and information *endowments*, but, as suggested above, also with the nature of information acquisition and processing procedures and more generally with the institutional setting.

It is however clear that the effort of the 'aprioristic' approach to explain why and how prices convey information through the economy has failed. In these models, the assumed degree of structural knowledge is so high that only little 'cognitive flexibility' is allowed. On the other hand, only

when 'hard' structure is poured in, one can reasonably assume that feedback from observation of market signals has sensible informative content for individuals (see Russell and Thaler, 1988). Under milder assumptions, for example, when it is postulated that the equilibrium correspondence is not known from the beginning but is learned through experience in the market, the revealing role of prices depends from *ad hoc* assumptions in the specification of the learning problem, especially when the degree of common knowledge of the equilibrium correspondence is to be fixed as well.

In fact, in the absence of a high degree of common knowledge, the master equation would generally be non-time autonomous (see e.g. Sacco, 1990, for a behavioral rationale), and the agents would have no basis to assess the effectiveness of their learning efforts, since the problem they are trying to solve changes through time. On the other hand, common knowledge seems unattainable through a learning process, at least as far as 'algorithmic' individuals acting on the basis of computable behavioral rules are concerned (see Shin, 1988). Therefore, there is no alternative to its inclusion in the specification of the original individual information sets.

In this respect the research project by Marcet and Sargent (1988) is of particular interest. They try to obtain rational expectations as a limit outcome of an adaptive (non equilibrium) learning process, according to the philosophy of Lucas (1986). Their work (see Marcet and Sargent, 1988), tries to give a general characterization of learning processes based on least-squares estimates that are self-referential in the sense that the actual conjectures of individual agents act on the law of motion of the economic system; here the nature and amount of structural knowledge available to people is more subtle: they are treated as 'naive' econometricians that use a simple forecasting rule that is not too computationally demanding.

The framework of Marcet and Sargent allows one to deal with a wide variety of different situations, not excluding systematic 'non-rational' misperception. Their strong result is that *if* the least-squares learning process converges, it must converge to a R.E. equilibrium. That is to say, a situation in which individual perceptions come to coincide with the ones induced by the 'optimal' regression, viz., the regression that minimizes the quadratic loss function. There are however relevant cases in which this learning mechanism does not converge (see e.g. Marcet and Sargent, 1989).

Though of interest *per se*, the Marcet and Sargent approach is not immune from the behavioral inconsistencies of the 'aprioristic' approach. In the first place, 'rationality' of expectations arising from a convergent least-squares mechanism should be due to their 'informational optimality' as resulting by the minimization of some loss function. But then it is quite

strange that they are *characterized* as the limit outcome of a non-informationally-optimal (viz. non-rational) learning process: to be rational eventually, people have to be non-rational most of the time. This seems peculiar, especially if the learning process takes time and individuals make their choices keeping in mind that the effectiveness of learning may have important welfare consequences for them. Learning in this context looks more like a struggle for life than like a scientific experiment. One cannot afford extravagant choices if one is not relatively safe about the outcome.

Second, this particular choice of the loss function and of the learning rule, though standard in the literature, has no particular rationale.

Third, what is the reliability, for the individual, of the outcomes of the least squares learning process at various stages? What is he really learning during this process? Once again, a large amount of structural knowledge is needed if the procedure has to make sense. In particular, the focus of attention moves from the master equation to the operator (the T operator in the Marcet and Sargent formalism) that evaluates the impact of individual conjectures on the law of motion of the system and plays a fundamental role in the computation of the expectations that minimize the loss functional. That suspicious, excessively close link between the definition of the standard of rationality and the contents of individual information sets, pops up again. Least squares learning is not a rational learning procedure for all possible environments; so, if individuals are willing to undertake it in the Marcet and Sargent case, they must know its asymptotical optimality properties for this special environment; consequently, they must have a fairly high degree of structural knowledge to justify their choice, and, in particular, they must know T.

The *ad hocness* of this specification of the learning problem, in line with the 'aprioristic' tradition, lies not only in the arbitrary choice of the contents of individual information sets, but also in the fact that when learning people actively exploit information they could only possibly know if learning had already fully taken place, as it is in the choice of the least squares learning procedure (here the argument of Bausor, 1983, 1986 crops up again). At some 'basic' level, the dependence of aggregate outcomes from individual forecasts must be predetermined and left unexplained.

In conclusion, the literature does not seem to be able to explain in a non ad hoc way *what* an agent knows and, more importantly, what he *can assume to know* when he sees that the observed market signals do not contradict previous information and moreover reveal something new. If in particular, as is often the case, more than one equilibrium correspondence exists, unless all individuals make a binding commitment to stick to the

same correspondence in making their inferences, then the market will generally not be cleared because prices reveal different states to different people, according to the equilibrium correspondence used, and individual decisions will not be mutually compatible. But if no such binding commitment is done or is viable, then the individual is left in the uncomfortable situation of one who 'does not know what he knows' when observing market signals.

Thus, following the threads of R.E. research on expectations formation, there hardly seems to be much room left for the 'revealing' role of prices after all. Rather, it is the degree of 'aprioristic' knowledge of structural characteristics of the system that really makes the difference between learning something or not. But since the acquisition of such knowledge is not justified (or, one could say, justifiable) in any way by the 'aprioristic' literature, one is inevitably led, to our opinion, to the conclusion that this stream of analysis basically misses the point as a characterization of rational behavior under asymmetric information.

5. *Conclusion*

From Hayek (1949) onwards, economists have often found it useful to distinguish between the point of view of an 'outside observer' and that of the agents operating in the economy. This distinction rests on the fact that the 'outside observer' may have access to information that is not available to 'common people' in the economy, and tends to coincide with that between 'the' economic theorist and the *homo oeconomicus* under study.

In fact, when saying that individuals use 'the relevant economic theory' to elaborate their predictions (compare Lucas, 1976), R.E. theorists actually assume that there can be no such splitting in analytical perspective, but not because, as one could expect, there is nothing like an 'outside observer' in the real world, but rather because everybody, or better every *rational* individual is, that is to say, like an 'outside observer' in the real world.

The economist's point of view, that is based (sic) upon the 'relevant' economic theory, *must* coincide with that of the economic agent for the simple reason that the latter will take advantage of any 'relevant' information, and a systematic theory about the working of the economic system is obviously an information of this kind. But then one has to recognize that no 'relevant', viz. universally subscribed, theory about the working of the system exists in the economics profession, and thus, in a like manner, nothing like 'the equilibrium price correspondence' can be on hand for

economic agents for the same reason for which it is not on hand for economists.

One could observe that the economic model is only an 'ideal' model, therefore its sensibility cannot be evaluated on the basis of real-life arguments such as the actual professional knowledge about the 'relevant' economic model. While being true in general, this remark is incorrect in the particular case of rational expectations models. The semantic content of the notion of rational expectations is based on its appeal to 'objective' knowledge of the economic system as opposed to 'subjective' knowledge. If it is pretended that rational expectations are only an ideal notion that makes sense in an ideal model, then there is no problem, since 'objective' knowledge of an ideal model is a perfectly sensible concept. But if rational expectations are meant as part of an explanation of real economic phenomena as they indeed are, then this 'objective' knowledge must necessarily be knowledge of the actual features of the economic system; hence economists, 'professional' people whose job is supposed to be the understanding of the working of the economy, are the natural subjects on which to perform this test on the *practical* sensibility of rational expectations.

What are the consequences of the above considerations for future research on the issue? The most important one is that the Lucasian idea that rationality must be seen as an application of the optimality principle to information acquisition and processing activities must be abandoned because it completely lacks behavioral foundation.

Some elaboration is in order here. According to what we might call the Friedman-Lucas thesis (see Friedman, 1953), 'rational' people make large profits on the market, or, better, they are able to exploit any systematic profit opportunity available on the market, because they are better informed and/or process the available information better than 'non-rational' people. Two testable propositions would thus follow: *a*) 'rational' people in the above sense perform better on the market; *b*) no systematic profit opportunity may persist in the market, since 'rational' people would exploit it. Both of these statements are not generally true, if not false, both on theoretical and experimental grounds (see De Long et al., 1987; Sterman, 1989; Schaffer, 1989; West, 1988; and also Sacco, 1989a).

But why is it so? Why should smart people in the Friedman-Lucas sense be generally unable to outperform less smart people? This is the central point of our paper: it is so because the intelligence of people in the Friedman-Lucas framework crucially depends on the amount and the nature of the initial distribution of information across the economy. As we have seen, the price mechanism cannot transmit knowledge about the structural

features of the economy if not within narrow limits, that is, one can learn something from prices only if one already possesses a fairly high degree of structural knowledge. One could object that there are people who have a high degree of structural knowledge precisely because they are rational, but one could ask in turn where this knowledge comes from. Structural knowledge is not something that can be basically acquired or transmitted through the market process, and so those who possess it are precisely those who are *defined* to be in that position. This accounts for both the theoretical and the empirical counterexamples to the Friedman-Lucas thesis that can be found in the literature.

From a theoretical point of view, since the nature and the distribution of information is a sort of 'free parameter' of the model, there may well be, and indeed there are, situations in which people basing their decisions on some 'spurious' kind of structural information ('noise', 'sunspots', etc.) actually outperform people using only 'correct' structural knowledge. The reason why this can happen is that the spurious structural knowledge, once embodied in the actual trade plans of 'noisy' people, obviously becomes self-fulfilling – it explains some of the observed characteristics of the market process, so taking account of it may be profitable. Given the theoretically dubious, or arbitrary (according to tastes) origin of the 'sensible' structural knowledge, there is hardly any room left to draw a clear distinction between those pieces of knowledge that must be included in the 'sensible' set of structural knowledge (the so called *fundamentals*) and those that must not. Consequently, there is also no room left to distinguish between those who are rational in the Friedman-Lucas sense and those who are not. We simply do not know any more who are those who are more likely to exploit the available profit opportunities on the market if we don't know more about the ways in which people collect and process information.

From the empirical point of view, the Friedman-Lucas thesis is simply not accurate because there is no encouraging, let alone compelling, evidence about the eventual disappearance of profit opportunities, both on an experimental and a truly empirical basis; see above for references.

To sum it all up, it seems that the use of structural knowledge to model individual cognitive activities leads to a dead end. Consequently, the behavioral foundations of 'rational' economic behavior have still to be laid down. Modern cognitive science as exemplified by Minsky (1986) provides us with a heap of fresh, new insights into the deep complexity of the cognitive process. Human cognitive structures have little in common with 'theories' or 'models'; they are organized into 'networks' of self-enforcing knowledge that cannot be falsified by new experience but rather used to

attach meaningful interpretations to it. One could say, this is cognitive science; it is not the economist's task to explain why and how people know what they know. This is perfectly right, but it does not mean that economists are free to ignore what is going on on the cognitive side. Giving up the use of arbitrary assumptions about structural knowledge is simply to acknowledge this state of things. The next step is obviously to take advantage of it. How to do so, this is the economist's task.

REFERENCES

ALLEN B., "General Equilibrium with Rational Expectations", in W. Hildenbrand and A. Mas-Colell, eds., *Contributions to Mathematical Economics. In Honor of Gérard Debreu*, Amsterdam: North-Holland, 1986.

BAUSOR R., "The Rational-Expectations Hypothesis and the Epistemics of Time", *Cambridge Journal of Economics*, 1983, *7*, 1-10.

——, "Time and Equilibrium", in P. Mirowski, ed., *The Reconstruction of Economic Theory*, Boston: Kluwer, 1986.

BRAY M.M. and SAVIN N.E., "Rational Expectations, Learning and Model Specification", *Econometrica*, 1986, *54*, 1129-60.

DEBREU G., *Theory of Value*, New York: Wiley, 1959.

DE LONG J.B., SHLEIFER A., SUMMERS L.H. and WALDMANN R.J., "The Economic Consequences of Noise Traders", NBER Working Paper No. 2395, Cambridge, Mass., 1987.

DONZELLI F. (1986a), *Il concetto di equilibrio nella teoria economica neoclassica*, Roma: Nuova Italia Scientifica, 1986.

—— (1986b), "Temporary Equilibrium, Intertemporal Equilibrium and the 'Complete Markets' Hypothesis", *Ricerche Economiche*, 1986, *40*, 214-48.

FARMER R.E. and WOODFORD M., "Self-fulfilling Prophecies and the Business Cycle", Mimeo, University of Pennsylvania, Philadelphia, 1984.

FRIEDMAN M., "The Case for Flexible Exchange Rates", in *Essays on Positive Economics*, Chicago: The University of Chicago Press, 1953.

GROSSMAN S.J., "An Introduction to the Theory of Rational Expectations Under Asymmetric Information", *Review of Economic Studies*, 1981, *48*, 541-59.

HAHN F., "On the Notion of Equilibrium in Economics", in *Equilibrium and Macroeconomics*, Oxford: Basil Blackwell, 1984.

——, "Information, Dynamics and Equilibrium", *Scottish Journal of Political Economy*, 1987, *34*, 321-34.

——, "Information, Dynamics and Equilibrium", Mimeo, Cambridge University, Cambridge, 1988.

HAYEK F.A. v., "Economics and Knowledge", in *Individualism and Economic Order*, London: Routledge & Kegan Paul, 1949.

HEINER R.A. (1986a), "Uncertainty, Signal-Detection Experiments, and Modeling Behavior", in R.N. Langlois, ed., *Economics as a Process. Essays in the New Institutional Economics*, Cambridge: Cambridge University Press, 1986.

—— (1986b), "Rational Expectations when Agents Imperfectly Use Information", *Journal of Post Keynesian Economics*, 1986, 8, 201-207.

JORDAN J.S., "A Dynamic Model of Expectations Equilibrium", *Journal of Economic Theory*, 1982, *28*, 235-54.

LUCAS R.E., Jr., "Econometric Policy Evaluation: A Critique", *Carnegie-Rochester Conference Series in Public Policy*, 1976, *1*, 19-46.

——, "Adaptive Behavior and Economic Theory", *The Journal of Business*, 1986, *59*, S401-26.

MARCET A. and SARGENT T.J., "The Fate of Systems with 'Adaptive' Expectations", *American Economic Association Papers and Proceedings*, 1988, *78*, 168-72.

——, and ——, "Least Squares Learning and the Dynamics of Hyperinflation", in W.A. Barnett, J. Geweke and K. Shell, eds, *Economic Complexity: Chaos, Sunspots, Bubbles, and Nonlinearity*, Cambridge: Cambridge University Press, 1989.

MINSKY M.P., *The Society of Mind*, Cambridge, Mass.: MIT Press, 1986.

RADNER R., "Competitive Equilibrium Under Uncertainty", *Econometrica*, 1968, *36*, 31-58.

——, "Existence of Equilibrium of Plans, Prices and Price Expectations in a Sequence of Markets", *Econometrica*, 1972, *40*, 289-303.

RUSSELL T., and THALER R. "The Relevance of Quasi Rationality in Competitive Markets", in D.E. Bell, H. Raiffa, and A. Tversky, eds., *Decision Making. Descriptive, Normative and Prescriptive Interactions*, Cambridge: Cambridge University Press, 1988.

SAARI D.G. and SIMON C.P., "Effective Price Mechanisms", *Econometrica*, 1978, *46*, 1097-1125.

SACCO P.L., "Rational Expectations in Dynamic General Equilibrium Models: A Taxonomic View", *Giornale degli Economisti e Annali di Economia*, 1988, *47, 253-75.*

—— (1989a), "Information and Outcomes", Mimeo, European University Institute, S. Domenico di Fiesole, 1989.

—— (1989b), "Sui fondamenti di equilibrio generale dell'economia dinamica: una rassegna critica", *Giornale degli Economisti e Annali di Economia*, 1989, *48*, 347-400.

——, "Walrasian Dynamics Without the Auctioneer", *Rivista Internazionale di Scienze Economiche e Commerciali*, July 1990, *37*, 607-28.

SCHAFFER M.E., "Are Profit-Maximisers the Best Survivors? A Darwinian Model of Economic Natural Selection", *Journal of Economic Behavior and Organization*, 1989, *12*, 29-45.

SHIN H.S., "Logical Structure of Common Knowledge II: Is Common Knowledge Possible between Algorithmic Individuals?", *Nuffield College Discussion Paper*, 1988, # 25, Oxford.

STERMAN J.D., "Deterministic Chaos in an Experimental Economic System", *Journal of Economic Behavior and Organization*, 1989, *12*, 1-28.

TOWNSEND R.M., "Arrow-Debreu Programs As Microfoundations of Macroeconomics", in T.F. Bewley, ed., *Advances in Economic Theory. Fifth World Congress*, Cambridge: Cambridge University Press, 1987.

——, "Models as Economies", *Economic Journal (Conference Papers)*, 1988, *98*, 1-24.

WEST K.D., "Bubbles, Fads and Stock Price Volatility Tests: A Partial Evaluation", *The Journal of Finance*, 1988, *43*, 639-56.

OSSERVAZIONI SULLA NOZIONE DI EQUILIBRI DI ASPETTATIVE RAZIONALI "RIVELATORI"

Nel presente lavoro si mostra come l'approccio 'aprioristico', secondo cui gli individui conoscono le caratteristiche strutturali rilevanti del sistema economico, non rappresenti una soluzione plausibile al problema della modellizzazione dei processi di formazione delle aspettative e del ruolo dei prezzi di mercato nei processi di raccolta e diffusione dell'informazione. Si considerano in particolare i modelli con equilibri di aspettative razionali 'rivelatori', e si mostra che il carattere 'rivelatorio' di tali equilibri dipende unicamente dall'elevato livello di 'conoscenza strutturale' degli individui, un'ipotesi che risulta del tutto implausibile tanto su basi teoriche che empiriche. Si considera infine brevemente un possibile approccio alternativo alla modellizzazione di tali fenomeni.

Rivista Internazionale di Scienze Economiche e Commerciali
Volume 38 (1991), N. 2, 133-150

THE PROPERTIES OF LOCAL RISK PREMIA UNDER A NON-COMPACT PROBABILITY DENSITY FUNCTION

Numerical analyses of the Bernoulli density function and the negative exponential utility function

by
ROBERT A. SPROULE *

I. *Introduction*

A Taylor-series expansion of the expected utility function (hereafter *EUF*) at a particular point in the function's domain yields an approximation of the *EUF*. This approximation is referred to as the Taylor polynomial or Taylor series [1]. This Taylor series is comprised of the sum of the product of *i*th-order derivatives of the utility function, and *i*th-order central moments of the associated probability density function (hereafter *PDF*). The difference between the values of the actual function, and the Taylor series, at the given point is the remainder or error term of the approximation. A poor approximation is marked by a "substantial" error term. Two factors account for a substantial error: when a *partial* sum provides a poor approximation of the

---

* Department of Economics, Bishop's University, Lennoxville, Quebec (Canada).

The Author gratefully acknowledges the receipt of valuable comments from C.T. Tsai. All remaining errors are the sole responsibility of the author.

[1] Consider any n-times differentiable function, $f(x)$. The Taylor-series expansion of $f(x)$ at $x = x^0$ is:

$$f(x) = f(x^0) + f^{(1)}(x^0) \cdot (x - x^0) + f^{(2)}(x^0) \cdot (x - x^0)^2/2! + f^{(3)}(x^0) \cdot (x - x^0)^3/3! + \ldots +$$

$$f^{(n)}(x^0) \cdot (x - x^0)^n/n! + R_n = a_0 + a_1 + a_2 + a_3 + \ldots + a_n + R_n.$$

The series is said *to converge* if: (a) $|a_{i+1}| / |a_i| < 1$ for $i = 0, 1, 2, 3, \ldots, n-1, n$, and (b) $\lim (R_n) = 0$ as $n \to \infty$. Criterion (a) is referred to as the Ratio Test. See ANTON (1980, pp. 356-75), HARTLEY and WYNN-EVANS (1979, pp. 195-221), and KAPLAN and LEWIS (1970, pp. 608-25).

actual function, or when the Taylor series lies outside the radius of convergence.

On the problems and limitations of employing the Taylor-series approximation method in expected utility analysis, much has been written. The more important benchmarks of this literature include the following. In the case of a *PDF* with an infinitesimally small variance, Pratt (1964, p. 125) has argued that a second-order Taylor-series expansion of the *EUF* is justifiable. Furthermore, Samuelson (1970) has defined the notion of a compact *PDF*, and its role in Taylor-series approximations of the *EUF*. Loistl (1976) has observed that: "... the more compact the density function is, i.e., the less the variance, the fewer terms of the Taylor-series expansion we must include to yield a correct result" (p. 908). One drawback to the use of a compact *PDF* has been noted by Tsiang (1972, pp. 356-7): Under the assumption of a compact *PDF*, the complete definition of the mean-variance tradeoff for the decision maker (hereafter *DM*) is impossible. As an alternative to Pratt's and Samuelson's prescription for the use of small, absolute measures of risk and hence compact *PDF*s as a means of ensuring the convergence of the Taylor series, Tsiang has proposed an approach which is concerned with the size of risk *relative to* the wealth of the *DM* – an approach which enables the use of non-compact *PDF*s. Tsiang writes: "it is not really necessary for risk to remain very small in absolute magnitude. What is necessary for ... a good approximation is merely that risk remain small *relatively* to the total wealth of the individual concerned" (p. 357). However, not until the numerical analyses of Loistl (1976), and Hassett et al. (1985), did a clear picture of the problems and limitations of applying the Taylor approximation method to expected utility analysis under a non-compact *PDF* appear. For example, in summarizing his numerical analyses, Loistl (1976) writes: It is obvious "that the approximation by Taylor series expansion is far more erroneous than hitherto assumed in most cases" (p. 908).

To date no research on local risk premia comparable to that of Loistl, and Hassett et al., has been reported. Without such benchmark research, there are dangers. For example, there is a danger of failing to make a distinction between local and global risk premia (e.g., Malinvaud, 1972, pp. 291-92, and Nicholson, 1989, p. 249) when differences between the two exist, and when the differences are not well understood [2]. And there is a danger of presenting local risk premia based on a third-order approximation

[2] After PRATT (1964), the following *terminology* is adopted: a risk premium based on the actual value of the *EUF* is termed a *global* risk premium, and a risk premium based on a Taylor-series approximation of the *EUF* is termed a *local* risk premium.

without due consideration given to the radius of converge (e.g., Kane, 1982, pp. 16-17) [3].

The purpose of the present paper is to address this oversight. That is, the objective of this paper is to investigate the properties of local risk premia based on second- and third-order approximations under a non-compact *PDF*. In doing so, four interrelated questions will be addressed, and these by means of a numerical analyses of the Bernoulli probability density, and the negative exponential utility, functions. These questions are: (1) Given a non-compact *PDF*, under what circumstances does a Taylor-series expansion generate a "good" approximation of a global risk premium? We shall show that the fit of the approximation improves as speed of convergence of the Taylor series is increased, or in the case at hand as the Arrow-Pratt measure of absolute risk aversion (hereafter *ARA*) is reduced towards zero. (2) Within the radius of convergence, does a risk premium based on a third-order expansion provide a better approximation of the global risk premium than a risk premium based on a second-order expansion? We shall show that it does in most, but not all, of the cases considered. (3) Given a non-compact *PDF*, are local risk premia order-preserving indicators of global risk premia? For example, if π denotes a global risk premium, and if π_i denotes a local risk premium of the ith-order, then does $\pi^a > \pi^b > 0$ imply $\pi_i^a > \pi_i^b > 0$? We shall show that local risk premia are not always order-preserving indicators of global risk premia. And (4) if local risk premia are not order-preserving indicators of global risk premia in general, then what restriction(s) might be applied to reduce the likelihood of premia-order inconsistencies? We shall show that the likelihood of the local risk premia preserving the ordering of global risk premia can be increased if the local risk premia lie within the radius of convergence, and if the speed of convergence is increased.

This paper is organized in the following manner. In Section II, *general* global and local risk premia are defined. These premia are termed general in that they are based upon the *general EUF* – that is, they are based upon a general utility, and a general probability density, function. In Section III, *function-specific* global and local risk premia are defined, and associated numerical analyses offered. We refer to these premia as function-specific in that in our numerical analyses these premia will be derived from the *negative exponential* utility, and the *Bernoulli* probability density, functions. Summary remarks are offered in Section IV.

[3] KANE (1982) derives a local *multiplicative* risk premium. In this paper, we investigate the properties of the local *additive* risk premium. Numerical analyses on the *multiplicative*, and *proportional*, risk premia subsequent to this paper might be warranted. For a definition of all three, see DARDANONI (1988, pp. 448-49). See also MENEZES and HANSON (1970).

II. *Definitions of the Global and Local General Risk Premia*

In the present Section, we define global, and local *general* risk premia. These premia are termed general in that they are based on any utility function which is increasing, and concave, in wealth.

(a) GLOBAL GENERAL RISK PREMIUM: To define a global risk premium, we begin by presenting the standard definitions for *generalized risk measure, attitude towards risk*, and the *certainty equivalent.*

Definition 1: The *generalized risk measure* (hereafter *GRM*), ϕ, is the difference between the *utility of expected wealth,* $U(\mu_1)$, and the *expected utility of wealth,* $E[U(W)]$ (i.e., $\phi = U(\mu_1) - E[U(W)]$ where $\mu_1 = E(W) = \int Wf(W)\,dW$, and where $f(W)$ is the *PDF* of wealth)[4].

Definition 2: The *DM* is said to exhibit one of three *attitudes towards risk* depending on the sign of the *GRM* – these being *risk aversion, risk neutrality*, or *risk affinity* as $\phi > 0$, $\phi = 0$, or $\phi < 0$ respectively.

Definition 3: The *risk premium* associated with a risk, W, is: (a) the difference between the expected value of the risk and the *certainty equivalent* (hereafter *CE*) (i.e., $\pi = \mu_1 - CE$), and (b) the amount by which the mean of the *PDF* of W must be changed so that the *DM* is indifferent between receiving the *CE* or $(\mu_1 - \pi)$ for certain, and W under risk (i.e., $U(CE) = U(\mu_1 - \pi) = E[U(W)]$).

Next, we reiterate two key relationships due to Stone (1970): the first between attitude towards risk and the global risk premium. To do so requires the introduction of Assumption 1.

Assumption 1: $U^{(1)}(W) > 0 \;\forall\; W$.

Lemma 1 (Stone, 1970, p. 15): If Assumption 1 holds, and if $dU = 0$, then: (a) the risk premium, π, is an increasing monotonic transformation of the *GRM*, ϕ, and (b) sign (ϕ) = sign (π).

Proof: From Definition 3, $U(\mu_1 - \pi) = E[U(W)]$. It follows from this and Definition 1 that:

[4] Elsewhere in the literature, the *GRM* has also been termed the preference intensity function. For example, see HANSON and MENEZES (1971, p. 212).

$$\phi = U(\mu_1) - E(U(W)] = U(\mu_1) - U(\mu_1 - \pi) \tag{1}$$

For small variations of ϕ and π in Equation (1), it is clear that $d\phi/d\pi = U^{(1)}(\mu_1 - \pi) > 0$, and as well sign (ϕ) = sign (π).

Lemma 2: The *DM* is said to exhibit *risk aversion, risk neutrality*, and *risk affinity* as $\pi > 0$, $\pi = 0$, and $\pi < 0$ respectively.

Proof: Definition 2 and Lemma 1.

(b) LOCAL GENERAL RISK PREMIA: To define local general risk premia, we define the requirements for the appropriate use of the Taylor-series expansion (i.e., that $U(W)$ be n-times differentiable, that all central moments of the *PDF* exist, and that the Taylor-series converge and converge quickly), and we define a Taylor-series expansion of the general risk premium.

Assumption 2: (a) $U(W)$ is n-times differentiable in a small neighborhood of μ_1, and (b) all n central moments of $f(W)$ exist (viz., $\mu_i = E(W - \mu_1)^i = \int (W - \mu_1)^i f(W)\, dW$ where $i = 2, 3, 4, \ldots, n-1, n$ exist).

Lemma 3 (*Stone, 1970, pp. 19-20*): If Assumption 2 holds, then the *GRM* is given by $\phi_n = -\sum_{i=2}^{n} [U^{(i)}(\mu_1) \cdot \mu_i/i!] + E[R_n(W; \mu_1)]$ where $R_n(W; \mu_1)$ is the nth-order remainder of the Taylor-series expansion about μ_1, i.e.,

$$R_n(W; \mu_1) = U^{(n+1)}(\alpha W + (1 - \alpha)\mu_1) \cdot (W - \mu_1)^{n+1}/(n+1)!$$

for $0 \leq \alpha \leq 1$.

Remark 1: The Taylor-series expansion is said to: (a) *converge* when (i) $|U^{(i)}(\mu_1) \cdot \mu_i/i!| > |U^{(i+1)}(\mu_1) \cdot \mu_{i+1}/(i+1)!|$ which is referred to as the Ratio Test, and (ii) $\lim_{n \to \infty} \{E[R_n(W;\mu_1)]\} = 0$, and (b) *converge quickly* when n is "small".

Assumption 3: The Taylor-series expansion: (a) *converges*, and (b) *converges quickly*.

Remark 2: If Assumptions 1, 2, and 3 (a) hold, then an nth-order approximation of the "*general-utility-function-based*" *GRM* may be written

as $\phi_n = U^{(1)}(\mu_1) \cdot R_A(\mu_1) \cdot \sum_{i=2}^{n} [\mu_i \cdot U^{(i)}(\mu_1)/U^{(2)}(\mu_1) \cdot i!]$ where $R_A(\mu_1) = -U^{(2)}(\mu_1)/U^{(1)}(\mu_1)$ or the Arrow-Pratt measure of *ARA*.

Remark 3: If Assumptions 1, 2, 3, (a), and 3 (b) hold, and $n = 2$, then: (a) sign (π_2) = sign (ϕ_2) = sign $(R_A(\mu_1))$, and (b) the *DM* is said to exhibit *risk aversion* as $\pi_2 > 0$, *risk neutrality* as $\pi_2 = 0$, and *risk affinity* as $\pi_2 < 0$ [5]. These results may be justified as follows. $U^{(1)}(\mu_1) > 0$ (Assumption 1). Also $\mu_2 = E(W - \mu_1)^2 > 0$. From Remark 2, if $n = 2$, then sign (ϕ_2) = sign $\{-U^{(2)}(\mu_1)\}$ = sign $\{R_A(\mu_1)\}$. Furthermore, sign (ϕ_2) = = sign (π_2) (Lemma 1).

Assumption 4: $U^{(2)}(W) < 0 \ \forall \ W$.

Assumption 5: $U^{(i')}(W) > 0 \ \forall \ W$, $U^{(i')}(W) = 0 \ \forall \ W$, or $U^{(i')}(W) < 0 \ \forall \ W$ for $i' = 3, 4, 5, \ldots, n-1, n$.

Lemma 4 (*Scott and Horvath, 1980*): If Assumptions 1, 4, and 5 hold, and if i' is odd (even), then $U^{(i')}(W) > (<) 0$ for $i' = 3, 4, 5, \ldots, n-1, n$.

Remark 4: If Assumptions 1, 2, 3 (a), 3 (b), 4, and 5 hold, and $n = 3$, then $\phi_3 > 0$ and $\pi_3 > 0$. This result follows from Remarks 1 and 2.

III. *Definitions of Global, and Local, Function-specific Risk Premia: The Case of the Bernoulli* PDF *and the Negative Exponential Utility Function*

In the present Section, we define global and local risk premia for the case of the Bernoulli *PDF* and the negative exponential utility function. Discussion begins with the Bernoulli *PDF*, and progresses to the negative exponential utility function, global and local function-specific risk premia, and finally to numerical analyses of these premia.

(a) *The Bernoulli PDF*: Let our consideration of $f(W)$ be restricted to a narrow class of *PDF*s, the Bernoulli *PDF*. This restriction takes the form of Assumption 6:

---

[5] π_2 is PRATT's (1964, p. 125) local risk premium. See also STONE (1970, pp. 20-21), LAYARD and WALTERS (1978, pp. 360-61), HILTON (1989, pp. 209-10).

Assumption 6: Assume the *PDF*, $f(W)$, is a *Bernoulli PDF* in that: (a) the Probability $(W = W_1) = P$, and (b) the Probability $(W = W_3) = (1 - P)$ where $W_1 < W_3$ [6].

Four general properties of the Bernoulli *PDF* warrant comment. Firstly, the *expected value of the Bernoulli PDF* is $E[W] = W_2 = \mu_1 = P \cdot \cdot W_1 + (1 - P) \cdot W_3$. Secondly, the *ith central moment of the Bernoulli PDF is* $\mu_i = P \cdot [W_1 - \mu_1]^i + (1 - P) \cdot [W_3 - \mu_1]^i$ for $i = 2, 3, 4 \ldots n - 1, n$. Thirdly, *all of the even-numbered central moments of the Bernoulli PDF are positive, and all of the odd numbered central moments are*: (i) negative if $P < 0.5$, (ii) zero if $P = 0.5$, and (iii) positive if $P > 0.5$ for $P \in (0,1)$. A proof of this is offered in Lemma 5. And fourthly, *the second central moment of the Bernoulli PDF* attains a *global maximum* at $P = 0.5$. A proof of this is offered in Lemma 6 [7].

Lemma 5: Under Assumption 6, if i is even, then $\mu_i > 0$ for $P \in (0,1)$. Under Assumption 6, if i is odd, then sign (μ_i) = sign $(P - 0.5)$.

Proof: (i) Consider $\{W_1, W_2, W_3\}$ such that $W_1 < W_2 < W_3$, and $\mu_1 = E(W) = = W_2 = P \cdot W_1 + (1 - P) \cdot W_3$. It follows that $W_3 = (W_2 - P \cdot W_1)/(1 - P)$.

(ii) The ith central moment is $\mu_i = P \cdot [W_1 - W_2]^i + (1 - P)$.

$[W_3 - W_2]^i = P \cdot [W_1 - W_2]^i + (-1)^i \cdot [W_1 - W_2]^i \cdot P^i \cdot (1 - P)^i$.

(iii) If i is even, it is clear from the above that $\mu_i > 0$.

(iv) Suppose i is odd. Therefore $\mu_i = [W_1 - W_2]^i$.

$[P - P^i (1 - P)^{1-i}]$. Since $[W_1 - W_2]^i < 0$, clearly sign $(\mu_i) =$

sign $\{-(P - P^i \cdot (1 - P)^{1-i})\}$. Now sign $\{P - P^i \cdot (1 - P^{1-i})\} =$

sign $\{(1 - P)^{i-1} - P^{i-1}\}$ = sign $\{1 - 2P\}$. In sum, sign (μ_i) = sign $(P - 0.5)$.

---

[6] This definition of the Bernoulli *PDF* warrants two comments. Firstly, the present definition is more general than the definition commonly used in the statistics literature. There, it is usually assumed that $W_1 = 0$, and $W_3 = 1$. For example, see Fisz (1963, pp. 129-30), Neter et al. (1966, pp. 127-29), and Larsen (1973, p. 9). Secondly, the present definition of the Bernoulli *PDF* is frequently employed in the economics literature. For example, see Borch (1969, p. 2; 1974, p. 428; and 1978, p. 181), Tsiang (1972, pp. 362-66; and 1974, pp. 446), Levy (1974), Menezes et al. (1980, p. 922), and Hassett et al. (1985, p. 40).

[7] Under the alternative definition of the Bernoulli *PDF* offered in Footnote 6, the properties include: (a) $\mu_1 = (1 - P)$, (b) $\mu_2 = P \cdot (1 - P)$, (c) $\mu_3 = -P \cdot (1 - 2P) \cdot (1 - P)$, and (d) μ_2 attains a maximum at $P = 0.5$.

Lemma 6: Under Assumption 6, if $i = 2$, then μ_i attains a global maximum at $P = 0.5$.

Proof: (i) $dW_2/dP = W_1 - W_3$ where $W_2 = E(W) = \mu_1$.

(ii) $d\mu_2/dP = (W_1 - W_2)^2 - (W_3 - W_2)^2 - 2P \cdot (W_1 - W_2) \cdot (W_1 - W_3) + 2 \cdot (1 - P) \cdot (W_3 - W_2) \cdot (W_1 - W_3) = 0$.

(iii) This implies that $P = \{(W_1 - W_2)^2 - (W_3 - W_2)^2 - 2 \cdot (W_3 - W_2) \cdot (W_1 - W_3)\}/\{2 \cdot (W_1 - W_3)^2\}$, and this simplifies to $P = 0.5$.

Some of these properties of the Bernoulli *PDF* are illustrated in the Figure 1. It should be noted that in Figure 1 [8], as with all subsequent figures, the parameters of the Bernoulli *PDF* are set at $W_1 = 6$, and $W_3 = 10$ over the interval $P \in [0,1]$. Granted, these values are chosen arbitrarily. However, their relative values are viewed as not being unrepresentative of problems associated with decision making under uncertainty.

The features of Figure 1 which warrant comment are threefold. Firstly, as P increases, it is clear that μ_1 declines from 10 to 6. Secondly, consistent with Lemma 5, μ_3 is non-positive if $P \leq 0.5$, and is non-negative if $P \geq 0.5$. And finally, consistent with Lemma 6, μ_2 attains a global maximum at $P = 0.5$.

(b) *The Negative Exponential Utility Function*: Let our consideration of $U(W)$ be restricted to a narrow class of utility-of-wealth functions, those which exhibit a *negative exponential functional form*. This Assumption is as follows:

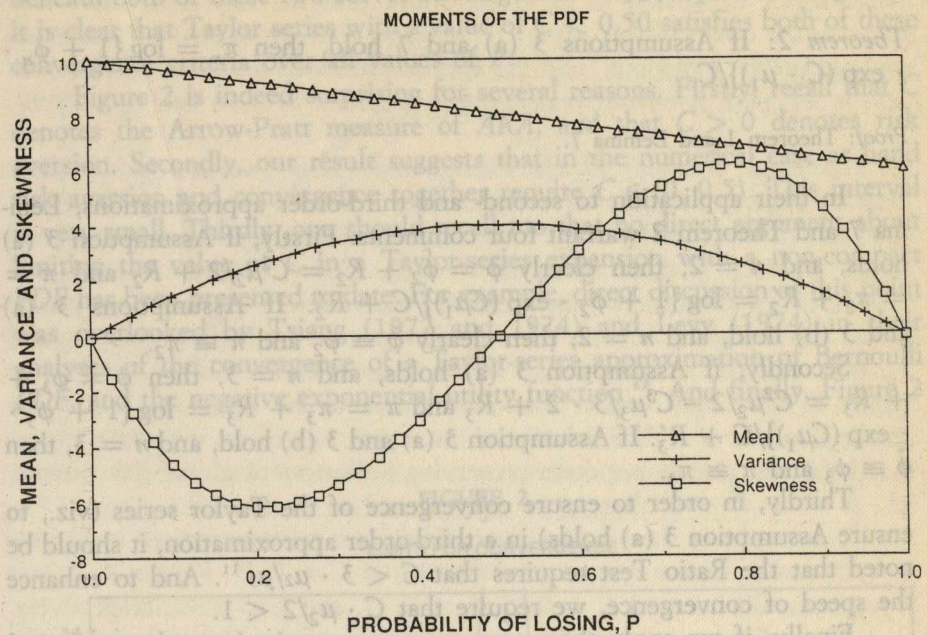
Assumption 7: Let the utility-of-wealth function, $U(W)$, assume the form of a *negative exponential function*, viz., $U(W) = B\{1 - \exp(-CW)\}$ where $B = 1$, $C > 0$, and $W > 0$ [9]. It should be noted too that this Assumption pre-empts the need for Assumptions 1 and 4.

---

[8] All numerical analyses are generated by *Lotus 1-2-3* Release 2, and the related graphics by *PrintGraph* Release 2. Both of these are software products of the Lotus Development Corporation.

[9] The properties of this utility function include: (a) $U(W) > 0$, (b) $U^{(1)}(W) > 0$, (c) $U^{(2)}(W) < 0$, (d) $R_A(W) = C$, (e) $dR_A(W)/dW = 0$ (or constant absolute risk aversion), (f) $U^{(i')}(W) > (<) 0 \; \forall \; i'$ odd (even) (see Lemma 4), (g) $(-1)^{i'} \cdot (C)^{i'} = \{U^{(i')}(W)/U^{(2)}(W)\}$ for $i' = 3, 4, 5, \ldots, n-1, n$ and (h) a Taylor-series expansion of $U(W)$ about W is convergent if $C < (i + 1)$ for $i = 2, 3, 4, \ldots, n-1, n$. (See Footnote 1 above).

FIGURE 1



(c) *A Global Function-Specific Risk Premium*: The global risk premium for the negative exponential utility function is:

Theorem 1 (*Stone, 1970, p. 23*): If Assumption 7 holds, then $\pi = \log\{1 + + \phi \cdot \exp(C \cdot \mu_1)\}/C$.

Proof: $\phi = U(\mu_1) - U(\mu_1 - \pi)$ (Lemma 1). Therefore under Assumption 7, it follows that $\phi = -\exp(-C\mu_1) + \exp(-C(\mu_1 - \pi)) = \exp(-C\mu_1) \cdot [\exp(C\pi) - 1]$. This implies $\phi \cdot \exp(C\mu_1) = \exp(C\pi) - 1$, and therefore implies $C \cdot \pi = \log\{1 + \phi \cdot \cdot \exp(C \cdot \mu_1)\}$, and $\pi = \log\{1 + \phi \cdot \exp(C \cdot \mu_1)\}/C$.

(d) *Local Function-Specific Risk Premia*: The local risk premia for the negative exponential utility function under second-, third-, and higher-order approximations are as follows:

Lemma 7: If Assumptions 3 (a) and 7 hold, then an nth-order approximation of the "exponential-utility-function-based" *GRM* may be written as

$$\phi_n = \exp(-C\mu_1) \cdot \sum_{i=2}^{n} (-1)^i \cdot C^i \cdot \mu_i/i!\ ^{10}.$$

Theorem 2: If Assumptions 3 (a) and 7 hold, then $\pi_n = \log\{1 + \phi_n \cdot \cdot \exp(C \cdot \mu_1)\}/C$.

Proof: Theorem 1 and Lemma 7.

In their application to second- and third-order approximations, Lemma 7 and Theorem 2 warrant four comments. Firstly, if Assumption 3 (a) holds, and $n = 2$, then clearly $\phi = \phi_2 + R_2 = C^2\mu_2/2 + R_2$ and $\pi = = \pi_2 + R_2' = \log\{1 + \phi_2 \cdot \exp(C\mu_1)\}/C + R_2'$. If Assumptions 3 (a) and 3 (b) hold, and $n = 2$, then clearly $\phi \cong \phi_2$ and $\pi \cong \pi_2$.

Secondly, if Assumption 3 (a) holds, and $n = 3$, then $\phi = \phi_3 + + R_3 = C^2\mu_2/2 - C^3\mu_3/3 \cdot 2 + R_3$ and $\pi = \pi_3 + R_3 = \log\{1 + \phi_3 \cdot \cdot \exp(C\mu_1)\}/C + R_3'$. If Assumption 3 (a) and 3 (b) hold, and $n = 3$, then $\phi \cong \phi_3$ and $\pi \cong \pi_3$.

Thirdly, in order to ensure convergence of the Taylor series (viz., to ensure Assumption 3 (a) holds) in a third-order approximation, it should be noted that the Ratio Test requires that $C < 3 \cdot \mu_2/\mu_3$ [11]. And to enhance the speed of convergence, we require that $C \cdot \mu_2/2 < 1$.

Finally, if we apply these two convergence criteria to the numerical problem at hand (viz., the Bernoulli *PDF* for which $W_1 = 6$, $W_3 = 10$, and the negative exponential utility function), the result is Figure 2. In Figure 2 there are two curves which represent two limits for convergence. These curves define the locus of points for which C is equal to a constant proportion of central moments which themselves vary over P, i.e., $C = 2/\mu_2$ or what is labelled "Limit 1", and $C = 3 \cdot \mu_2/\mu_3$ or what is labelled "Limit

---

[10] In contrast with Footnotes 1 and 9 (h), convergence of this *EUF* requires the following results:

$$\exp(-C\mu_1 \cdot \sum_{i=2}^{n} (-1)^i \cdot C^i \cdot \mu_i/i!$$

$$= \exp(-C\mu_1) \cdot C \cdot [C \cdot \mu_2/2! - C^2 \cdot \mu_3/3! + C^3 \cdot \mu_4/4! - \ldots + C^{n-1}\mu_n/n!]$$

$$= \exp(-C\mu_1) \cdot C \cdot [a_2 + a_3 + a_4 + a_4 + \ldots + a_n]$$

$$= \exp(-C\mu_1) \cdot C \cdot S^*$$

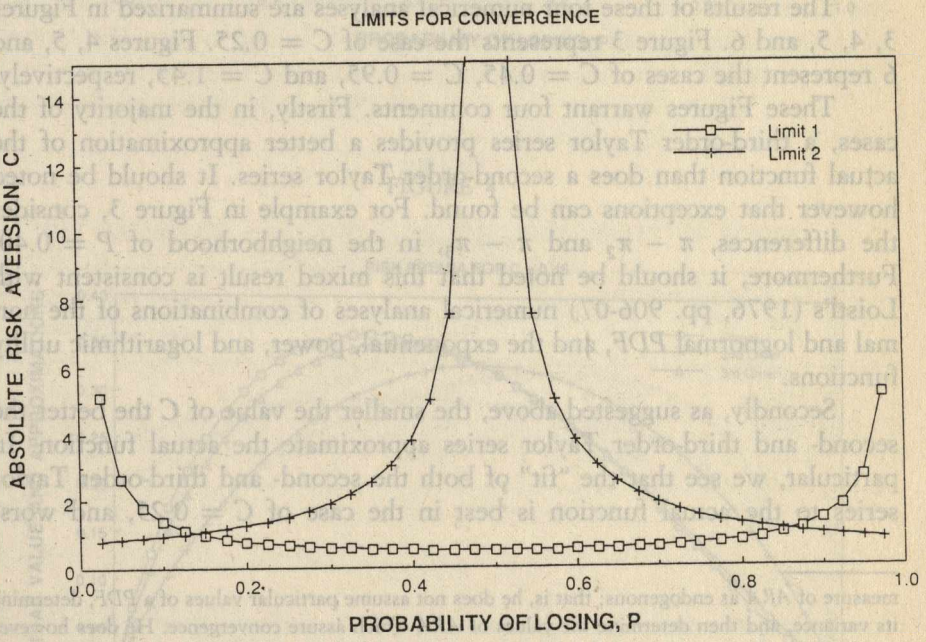
After Footnote 1, the series, S^*, is said to converge if: (a) $|a_{i+1}/a_i| = |\mu_{i+1} \cdot - 1)\, C/\mu_i(i+1)| < 1$ which implies $C < |(i+1) \cdot \mu_i/\mu_{i+1}|$ for $i = 2, 3, 4, \ldots, n-1, n$, and (b) $\lim (C^{n-1}\mu_n/n!) = 0$ as $n \to \infty$.

[11] See Footnotes 1 and 10.

2". The merit if these curves is this: Taylor series whose value of C lies beneath both of these two curves converges. So for example from Figure 2, it is clear that Taylor series with a value of $C < 0.50$ satisfies both of these convergence criteria over all values of P.

Figure 2 is indeed surprising for several reasons. Firstly, recall that C denotes the Arrow-Pratt measure of *ARA*, and that $C > 0$ denotes risk aversion. Secondly, our result suggests that in the numerical case at hand risk aversion and convergence together require $C \in (0, 0.5)$. This interval is very small. Thirdly, one should recall too that no direct argument about limiting the value of C in a Taylor-series expansion with a non-compact *PDF* has been presented to date. For example, direct discussion of this point was overlooked by Tsiang (1972 and 1974) and Levy (1974) in their analyses of the convergence of a Taylor-series approximation of Bernoulli *PDF*, and the negative exponential utility function [12]. And finally, Figure 2

FIGURE 2



[12] TSIANG (1972, pp. 357-59) does not pursue our line of analysis. In his argument against absolute, and for relative, measures of risk, Tsiang does not treat specific values of the Arrow-Pratt

seems to support Loistl's (1976) view about the dangers of employing a Taylor-series expansion in expected utility analysis. His perspective was stated at the outset of this paper. To repeat, Loistl writes that his numerical analyses makes it obvious "that the approximation by a Taylor series expansion is *far more erroneous* than hitherto assumed in most cases" (p. 908).

(e) *Numerical Analyses of the Global and Local Function-Specific Risk Premia*: Figure 2 serves as a benchmark for four remaining numerical analyses. In these analyses, we shall consider cases involving four different values of *ARA* − these being $C = 0.25$, $C = 0.45$, $C = 0.95$ and $C = 1.45$. In all cases, we shall compare the values of one function-specific global risk premium, π, with two function-specific local risk premia, π_2 and π_3, over $P \in (0,1)$. Based on an initial analysis of the results reported in Figure 2, we might expect that the smaller C the better π_2 and π_3 as approximations of π [13]. Furthermore, on *a priori* grounds, we might expect that local risk premia are order-preserving indicators of global risk premia, i.e., if $\pi^a > \pi^b > 0$, then $\pi_2^a > \pi_2^b > 0$ and $\pi_3^a > \pi_3^b > 0$.

The results of these four numerical analyses are summarized in Figures 3, 4, 5, and 6. Figure 3 represents the case of $C = 0.25$. Figures 4, 5, and 6 represent the cases of $C = 0.45$, $C = 0.95$, and $C = 1.45$, respectively.

These Figures warrant four comments. Firstly, in the majority of the cases, a third-order Taylor series provides a better approximation of the actual function than does a second-order Taylor series. It should be noted however that exceptions can be found. For example in Figure 3, consider the differences, $\pi - \pi_2$ and $\pi - \pi_3$, in the neighborhood of $P = 0.40$. Furthermore, it should be noted that this mixed result is consistent with Loistl's (1976, pp. 906-07) numerical analyses of combinations of the normal and lognormal *PDF*, and the exponential, power, and logarithmic utility functions.

Secondly, as suggested above, the smaller the value of C the better the second- and third-order Taylor series approximate the actual function. In particular, we see that the "fit" of both the second- and third-order Taylor series to the actual function is best in the case of $C = 0.25$, and worst

---

measure of *ARA* as endogenous; that is, he does not assume particular values of a *PDF*, determine its variance, and then determine the values of *ARA* which assure convergence. He does however conclude that if the product of the *ARA* measure and the standard deviation of the *PDF* is small then convergence of the series is assured.

[13] The Taylor-series approximation of ϕ may be written as: $\phi = \phi_n + R_n$. Therefore, $\phi_n = \phi - R_n$, $\pi_n = \log\{1 + (\phi - R_n) \cdot \exp(C \cdot \mu_1)\}/C$. Finally, as $C \in (0,\bar{C}]$, then as $C \to 0$, $R_n \hookrightarrow 0$, and $\pi_n \to \pi$.

FIGURE 3

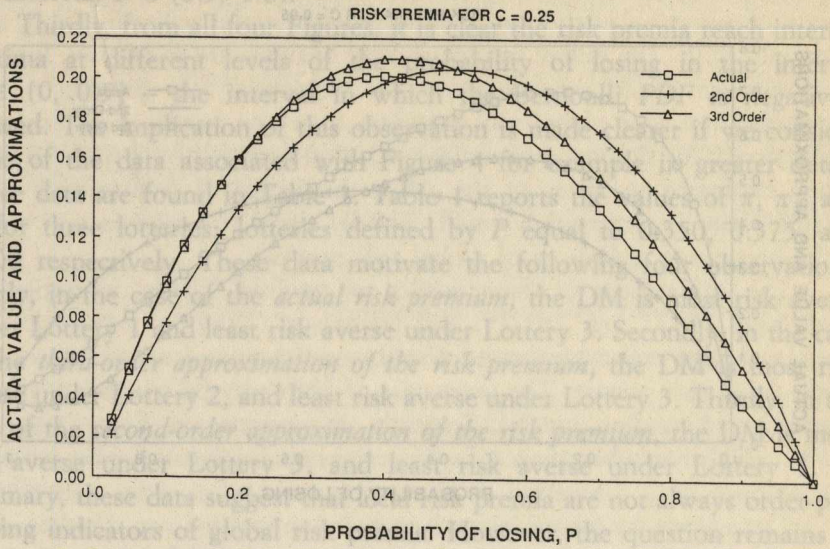


FIGURE 4

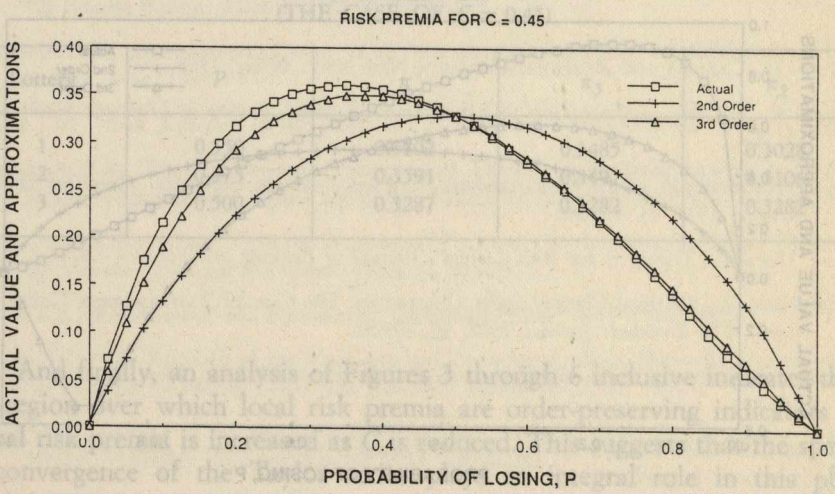


FIGURE 5

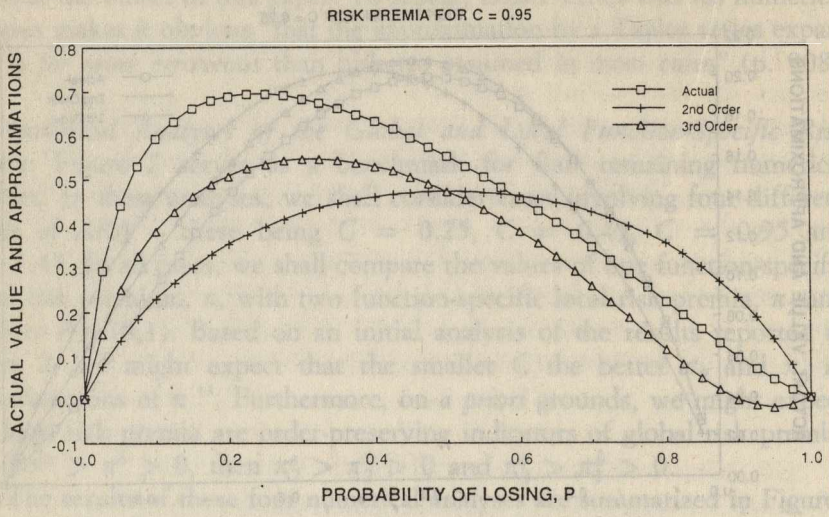
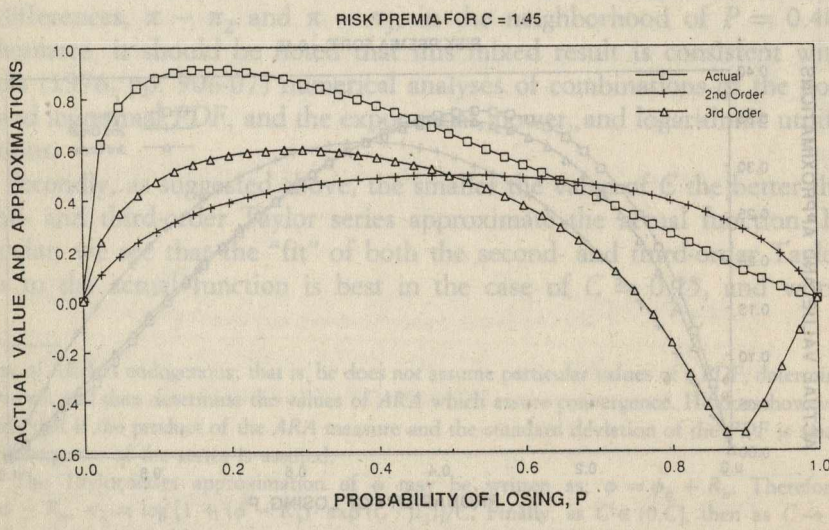


FIGURE 6



in the case of $C = 1.45$. Inspection of Figure 6 which presents the results for $C = 1.45$ points up evidence of *divergence* of the third-order series in the interval, $P \in (0.5, 1.0)$.

Thirdly, from all four Figures, it is clear the risk premia reach internal maxima at different levels of the probability of losing in the interval $P \in (0, 0.5]$ – the interval in which the Bernoulli *PDF* is negatively skewed. The implication of this observation is made clearer if we consider some of the data associated with Figure 4 for example in greater detail. These data are found in Table 1. Table 1 reports the values of π, π_3, and π_2 for three lotteries; lotteries defined by P equal to 0.350, 0.375, and 0.500 respectively. These data motivate the following four observations. Firstly, in the case of the *actual risk premium*, the DM is most risk averse under Lottery 1 and least risk averse under Lottery 3. Secondly, in the case of the *third-order approximation of the risk premium*, the DM is most risk averse under Lottery 2, and least risk averse under Lottery 3. Thirdly, in the case of the *second-order approximation of the risk premium*, the DM is most risk averse under Lottery 3, and least risk averse under Lottery 1. In summary, these data suggest that local risk premia are not always order-preserving indicators of global risk premia. However, the question remains as to whether or not this phenomenon holds up under other *EUF*s, especially those with negatively-skewed *PDF*s.

TABLE 1

THE VALUES OF π, π_3, AND π_2 BY THE PROBABILITY OF LOSING, P (THE CASE OF $C = 0.45$)

Lottery	P	π	π_3	π_2
1	0.350	0.3602	0.3485	0.3028
2	0.375	0.3591	0.3497	0.3106
3	0.500	0.3287	0.3282	0.3282

And finally, an analysis of Figures 3 through 6 inclusive indicates that the region over which local risk premia are order-preserving indicators of global risk premia is increased as C is reduced. This suggests that the speed of convergence of the Taylor series plays an integral role in this phenomenon.

IV. *Summary Remarks*

In this paper, the properties of local risk premia were assessed by means of numerical analyses of a negative exponential utility function, and a Bernoulli *PDF*. The salient results of these analyses are as follows. Firstly, a risk premium based on a second-order expansion may provide a better approximation of a global risk premium than one based on a third-order expansion. This finding supports a conclusion reported by Loistl. Secondly, when expressed in terms of the *ARA*, the radius of convergence of the Taylor series is surprisingly small. Thirdly, local risk premia may not be order-preserving indicators of global risk premia.

The implications of these results are twofold. Firstly, in response to Malinvaud (1972, pp. 291-29) and Nicholson (1989, p. 249), local risk premia should never be treated (tacitly or otherwise) as interchangeable with global risk premia. The properties of both may be so distinctive as to render a substitution invalid. Secondly, in response to Kane (1982, pp. 16-17), risk premia based on a Taylor-series expansion can not be defined in the absence of a discussion of the requirements for series convergence.

The agenda for future research includes an inquiry into whether or not local risk premia are order-preserving indicators of global risk premia under *PDF*s other than the Bernoulli, and under utility functions other than the negative exponential utility function.

REFERENCES

ANTON H., *Calculus with Analytical Geometry*, New York: Wiley, 1980.

BORCH K., "A Note on Uncertainty and Indifference Curves", *Review of Economic Studies*, 1969, *36*, 1-4.

——, "The Rationale of the Mean-standard Deviation Analysis: Comment", *American Economic Review*, 1974, *64*, 428-30.

——, "Portfolio Theory is for Risk Lovers", *Journal of Banking and Finance*, 1978, *2*, 179-81.

DARDANONI V., "Optimal Choices under Uncertainty, The Case of Two-argument Utility Functions", *The Economic Journal*, 1988, *98*, 429-50.

FISZ M., *Probability Theory and Mathematical Statistics*, 3rd Edition, New York: John Wiley, 1963.

HANSON D.L., and MENEZES C., "On a Neglected Aspect of the Theory of Risk Aversion, "*Western Economic Journal*, 1971, *9*, 211-17.

HARTLEY P.J., and WYNN-EVANS A., *A Structured Introduction to Numercial Methods*, London: Stanley Thornes, 1979.

HASSETT M., SEARS R.S., and TRENNEPOHL G.L., "Asset Preference, Skewness, and the Measurement of Expected Utility", *Journal of Economics and Business*, 1985, *37*, 35-47.

HILTON R.W., "Risk Attitude under Random Utility", *Journal of Mathematical Psychology*, 1989, *33*, 206-22.

KANE A., "Skewness Preference and Portfolio Choice", *Journal of Financial and Quantitative Analysis*, 1982, *17*, 15-26.

KAPLAN W., and LEWIS D., *Calculus and Linear Algebra*, Volume 1, New York: Wiley, 1970.

LARSEN H.J., *Introduction to the Theory of Statistics*, New York: Wiley, 1973.

LAYARD P.R.G., and WALTERS A.A., *Microeconomic Theory*, New York: McGraw-Hill, 1978.

LEVY H., "The Rationale of the Mean-standard Deviation Analysis: Comment", *American Economic Review*, 1974, *64*, 434-41.

LOISTL O., "The Erroneous Approximation of Expected Utility by Means of a Taylor Series Expansion: Analytical and Computational Results", *American Economic Review*, 1976, *66*, 904-10.

MALINVAUD E., *Lectures on Microeconomic Theory*, Amsterdam: North-Holland, 1972.

MENEZES C., and HANSON D.L., "On the Theory of Risk Aversion", *International Economic Review*, 1970, *11*, 481-87.

——, GEISS C., and TRESSLER J., "Increasing Downside Risk", *American Economic Review*, 1980, *70*, 921-32.

NETER J., WASSERMAN W., and WHITMORE G., *Fundamental Statistics for Business and Economics*, 4th Edition Boston: Allyn and Bacon, 1966.

NICHOLSON W., *Microeconomic Theory: Basic Principles and Extensions*, 4th Edition, New York: Dryden Press, 1989.

PRATT J.W., "Risk Aversion in the Small and in the Large", *Econometrica*, 1964, *32*, 122-36.

SAMUELSON P.A., "The Fundamental Approximation Theorem of Portfolio Analysis in Terms of Means, Variances, and Higher Moments", *Review of Economic Studies*, 1970, 37, 537-42.

SCOTT R., and HORVATH P., "On the Direction of Preference for Moments of Higher Order than the Variance", *Journal of Finance*, 1980, *35*, 915-20.

STONE B.K., *Risk, Return, and Equilibrium*, Cambridge, Mass.: MIT Press, 1970.

TSIANG S.C., "The Rationale of the Mean-standard Deviation Analysis, Skewness Preference, and the Demand for Money", *American Economic Review*, 1972, *62*, 442-50.

——, "The Rationale of the Mean-standard Deviation Analysis: Reply and Errata for Original Article", *American Economic Review*, 1974, *64*, 442-50.

LE PROPRIETÀ DEL RISK PREMIUM LOCALE NEL CASO DI UNA FUNZIONE NON COMPATTA DI DENSITÀ DI PROBABILITÀ

Analisi numeriche della funzione di densità di Bernoulli e della funzione di utilità esponenziale negativa

Nonostante il vasto uso del risk premium locale nel caso di una funzione non compatta di densità di probabilità, vi è stata poca o nessuna discussione sulle sue proprietà. Questo articolo colma questa lacuna presentando quattro risultati di analisi numeriche della funzione di densità di probabilità di Bernoulli e della funzione di utilità esponenziale negativa. Il primo risultato è che l'intervallo entro cui la serie di Taylor converge può essere sorprendentemente piccolo. Il secondo è che il risk premium locale calcolato in base alla espansione di terzo ordine della funzione di utilità attesa non fornisce sempre una approssimazione del risk premium globale migliore di un risk premium locale calcolato in base alla espansione di secondo ordine, anche se la serie di Taylor si trova nel raggio di convergenza. Il terzo risultato è che il risk premium locale può non essere un indicatore che mantiene l'ordine del risk premium globale. Il quarto risultato è che la serie di Taylor deve essere limitata al raggio di convergenza e deve convergere rapidamente se si vuole che il risk premium locale sia un indicatore che mantiene l'ordine del risk premium globale.

Rivista Internazionale di Scienze Economiche e Commerciali
Volume 38 (1991), N. 2, 151-168

MAIN DEVELOPMENTS IN THE THEORY OF THE MULTINATIONAL ENTERPRISE: A CRITICAL VIEW

FRANCESCA SANNA RANDACCIO *

1. *Introduction*

The literature on the theory of the Multinational Enterprise (MNE) is by now quite vast, however it still remains at times obscure and in need of refinement. Newcomers to it are faced with a flourishing of seemingly different schools of thought, ranging from a Hymer-Kindleberger Tradition to an Internalization Theory and an Eclectic Approach. It is sometimes unclear if and how these theories differ, whether in the questions asked or in the answers provided. Terminology is often confusing, adding to the overall difficulties already present in this branch of economics.

This paper will try to clarify which are the main theoretical approaches to the study of MNE. The development of these approaches will be examined focusing on similarities and differences between them. Considerable attention will be paid to the work of Hymer, an author who is widely recognized as the precursor of the theory of MNE. It will be shown that Hymer's theoretical framework contained important insights which have been lost in subsequent developments.

A comprehensive survey will not be attempted. Only some of the most important contributions on one specific aspect of MNE theory, namely the determinants of the decision to invest abroad, will be considered. The analysis will be focused on studies conducted at the firm and industry level [1]. Questions relating to the definition of MNE and its welfare implications will be left aside.

---

* University of Rome 'La Sapienza', Department of Economics, Rome.

[1] Macroeconomic approaches will not be considered in this study. On this aspect see GRAY (1982) and CANTWELL (1988).

2. *Stephen Hymer: The International Operations of National Firms*

Modern theory of multinational enterprises is generally recognized as having originated with the 1960 doctoral dissertation of Stephen Hymer, eventually published in 1976 (Hymer, 1976). Although there exist numerous summaries of Hymer's main ideas, it is still useful to go back to the text. In spite of its ambiguities, the analysis set out there is both much clearer and more complex than the versions of it usually presented as "the Hymer's approach".

It is thanks to Hymer that direct investment (DI) theory leaves its narrow macroeconomic boundaries – i.e. it stops concentrating on profit rate differentials – to enter the microeconomic domain as a legitimate branch of the theory of the firm. In his words:

> "The theory of international operations is part of the theory of the firm ... The tools used to analyze international operations are the same, essentially, as those used to analyze the firm in its domestic operations. But there are two important differences: the operations are international and the firms are national" (Hymer, 1976, pp. 27-8).

Hymer clearly states that his theory applies only to national enterprises. This includes firms in the first stages of expansion abroad, during which operations conducted in other countries require greater investment and are more risky than domestic ones. He suggests that firms are gradually losing their national identities as a result of the rapid disappearance of the separation of markets and because of the increasing internationalization of enterprises. He writes:

> "In recent years ... we may be watching the integration of the world economy ... But it has not happened yet and the firms are national firms and not international firms. Their nationality is of the utmost importance, for it affects the way they behave, and it affects the treatment they receive" (Hymer, 1976, p. 29).

The contrast between firms being *national* and operations *international*, a contrast emphasized in the very title of Hymer's thesis, is seen as central to the problem under investigation. It is this diverseness that gives rise to the costs of internationalization, which is one of the structural components of his theory. From what we said it follows that Hymer's analysis will need modifying if it is to be applied to international firms.

Attention then is concentrated on the firm, but the firm is not to be studied as an isolated entity: in a theory of direct investment the unit of analysis is the firm and the industry in its international context (Hymer,

1976, pp. 97, 161). In order to analyze how a firm expands abroad, one must also know the structure of the market in which it operates, and therefore the relationships between the enterprise and its competitors (national and international).

The starting point of Hymer's theoretical construction are the "barriers to internationalization". It is stressed that relative to local producers the foreign firm faces additional costs of information stemming from linguistic, cultural, legal, political and economic differences between countries, and extra-costs deriving from the need to coordinate and control the new operation at a distance. One might also consider as an additional cost the greater risks involved in foreign investment as a result of fluctuations in exchange rates and of the possibility of the foreign government discrimination against the investing firm as in the case of expropriation (Hymer, 1976, pp. 34, 53).

It is therefore necessary to explain: "why firms, despite the disadvantages, still find it profitable to have foreign operations" (Hymer, 1976, p. 36).

Hymer offers three answers to this question. He considers three different types of direct investment according to the motivation behind foreign expansion. The first, DI due to the possession of advantages, is the most important and for the greater part of his analysis he concentrates on this case. The other two types of DI, Type 2 (aimed at removing conflicts) and Type 3 (due to diversification) are only mentioned briefly, and no proper model for them is offered.

Type 1: Direct investment due to the possession of advantages. – Caves (1982) has rightly considered this model as an explanation of horizontal DI, i.e. of those cases in which the firm invests abroad to manufacture the same line of goods produced at home. Hymer does not explicitly recognize the link between Type 1 DI and horizontal expansion, but various passages confirm this interpretation.

Hymer's explanation of Type 1 DI is based on the existence of disadvantages and advantages for the firm expanding in the international market. Relative to local producers – as we saw earlier – the foreign firm must face extra-costs of information and coordination and costs due to higher risks, i.e. the barriers to internationalization.

Against these extra-costs the investing firm must therefore enjoy some kind of advantage over local producers, who would otherwise enter production themselves. Referring to Bain's analysis of barriers to entry, Hymer (1976, pp. 41, 42) suggests that this advantage may derive from the fact

that the firm has *a*) preferential access to capital or managerial skills, *b*) special technological skills and/or *c*) special marketing skills. He adds: "The significant aspect of most advantages is that marginal costs are close to zero" (Hymer, 1976, P. 219). These are, therefore, advantages predating direct investment, which I will term here "*ex-ante* advantages", stemming from skills acquired by the firm thanks to investments made in the past.

The concept of "advantage", which is central to Hymer's approach and to subsequent developments of DI theory, is often used ambiguously in the literature. Casson (1984) emphasizes that one must specify with respect to whom the advantage is held. He also calls attention to the need to distinguish between monopolistic and non-monopolistic advantages. A monopolistic advantage implies that the firm possesses some form of superiority not only over local producers in the country of investment but also over all other firms operating in the industry. In the case of non-monopolistic advantage, on the other hand, the foreign investor may have an advantage over local firms in the host country but not over other producers.

The relative nature of the advantage has been brought out quite clearly by Hymer:

> "We are interested in the advantages possessed by firms of one country relative to firms of another country insofar as these determine the nationality of the firm conducing a certain enterprise. That is, we are interested in the barriers to entry, not as they apply to new firms, but as they apply to firms of a different nationality" (Hymer, 1976, p. 42).

According to Hymer a firm's advantages must be defined in relation to a particular country. Indeed they depend both on the barriers to internationalization by which the market is protected, and on the abilities of local firms.

As regards the nature of the advantage, Hymer offers a number of answers. He points out that there are various cases in which a firm will invest abroad in order to exploit an advantage *in loco*:

> "The rarest case will be the one where there is a single firm which has advantages over all other firms in the world in the production of a particular product through, for example, its possession of a strong patent ... A more prevalent case of international operations occurs in industries where there is not one but several firms with advantages. However it is not likely that there will be many firms with advantages. For if there are many firms entry is probably easy and local firms with the special advantage of their nationality will predominate" (Hymer, 1976, pp. 92, 93).

This second case does not therefore constitute an example of monopolistic advantage, at least in the sense in which the term is used by Casson which, we may note, is the correct one. It would seem in this instance to be more appropriate to use the concept of "oligopolistic advantage" as employed by Lall (1976) [2]. This allows us to speak of firm specific advantages which may be either oligopolistic or monopolistic in character.

Hymer never uses the term monopolistic advantage. He sometimes refers to monopoly (Hymer, 1976, pp. 47, 85, 91). However he much more frequently underlines the oligopolistic nature of the industries in which there is DI (Hymer, 1976, pp. 87, 88, 93, 99). The term monopolistic advantage does not belong as is often claimed (see, for instance, Casson, 1984), to the Hymer tradition but rather, as we shall see, to the Kindleberger tradition.

Adapting Hirsch's (1976) model, Hymer's ideas may be summarized as follows. The *ex-ante* firm specific advantage will be indicated as K, which stands as the present value of the costs the local producers must incur in planning period T (from t_0 to t_1) in order to bring themselves to par with foreign competitors. K, which is a barrier to entry for locals, will thus be equal to: (i) the value of assets controlled by the foreign investor, minus (iia) the costs for the foreign investor to transfer these assets from one market to another [3] and (iib) the value of assets of a similar nature controlled by the local producers. The barriers to internationalization will be indicated by C, the present value of the extra-costs of information, coordination and costs due to the higher risks the firm must sustain in planning period T relative to local producers in the host market.

From Hymer's framework a necessary, albeit not sufficient, condition for the firm to operate in a foreign market can be derived, namely that $K \geq C$.

We may now briefly examine some implications of considering oligopolistic advantages. Most often an oligopoly is formed by a few dominant producers and by weaker members (asymmetrical oligopoly). If the holding of a monopolistic advantage is no longer taken to be a necessary condition for DI, it then becomes possible to also explain the DI of weaker members of

---

[2] The question whether the advantage is "monopolistic" or "oligopolistic" is connected with another problem: the degree of aggregation at which the industry is defined. This choice, it is clear, must be made dependent on the phenomenon analyzed. If one, like Hymer, is studying competition in the international market in the medium long run, a "broad" definition seems more appropriate than a "narrow" one.

[3] The costs of technology transfer include the costs of adaptation to foreign conditions, see TEECE (1986).

the industry. The model suggests that if the condition $K \geq C$ is satisfied with respect to local producers in that particular host country, the oligopolistic "weak" firm will be in a position to invest abroad even if it does not have advantages – indeed has a negative K – compared to stronger producers operating in other parts of the world. The fact that leading producers, who enjoy a K over all other members of the industry, do not themselves exploit all the investment possibilities available at any given moment, can be explained as a result of the factors that limit the size of an enterprise.

Hymer points out that the possession of a compensatory firm specific advantage is not in itself a condition sufficient for a DI. This is because: *a*) "for one thing, the firm could export the commodity in which the advantage is embodied" and *b*) "the firm can often licence, rent or sell otherwise its advantage" (Hymer, 1976, p. 47).

According to this author we must, therefore, if we are to explain investment abroad, not only understand why the enterprise is able to operate on the foreign market in spite of the presence of barriers to internationalization, in other words identify the firm-specific advantage, but we must also explain why the enterprise wishes to produce *in loco*, preferring to do so rather than concede patents or export.

The explanation Hymer offers for why a firm internalizes the advantage, effecting a DI rather than making use of the market, for example by giving patents to firms in other countries, presents some similarities with what has come to be called the theory of internalization, or transaction cost theory:

> "Why does a firm use the advantage itself instead of licensing it? We can view the problem this way. The firm is a practical institutional device which substitutes for the market. The firm internalizes or supersedes the market. A fruitful approach to our problem is to ask *why the market is an inferior method of exploiting the advantage*, i.e. we look at imperfections in the market" (Hymer, 1976, pp. 47, 48, my emphasis)[4].

Hymer points out that due to market imperfections, such as uncertainty, it may be difficult to arrive at a contract satisfactory to both parties, and there may be divergencies over the evaluation of the goods which are the object of the transaction (Hymer, 1976, pp. 48-50). Under these circumstances internalization is a way for the firm to save on market transaction costs, thus being a strategy *caused by* existing market imperfections. Hymer (1976, pp. 48, 220) suggests however, that in other instances this strategy

[4] Coase's work is not mentioned in Hymer's thesis, but is quoted in later articles by this author.

may be pursued in order to maintain, or increase, barriers to entry, becoming therefore *a cause of* market imperfections. Internalization theory, at least in its initial formulation, detects only the first of these two facets of internalization hinted at by Hymer.

He makes only brief reference to how firms choose between direct investment and export. Here Hymer underlines the role played by costs of production as a localization factor.

Summing up, Hymer maintains that to explain horizontal DI undertaken by national firms (Type 1 DI) one must look at four main aspects of the problem:

1. The barriers to internationalization (*C*).
2. Which *ex-ante* firm specific advantage permits *C* to be overcome.
3. The determinants of the choice between licence and DI.
4. The determinants of the choice between DI and export.

Type 2: Direct investment aimed at removing conflict. – In the case of industries highly concentrated at the international level, Hymer suggests that the motive inducing the firm to put into effect a DI may be that of limiting competition and thus increasing its market power.

This, according to Hymer, is an important determining factor of vertical DI, aimed at ensuring control over sources of raw material supplies. If few producers and buyers are operating on the international market, the firm integrating backward through DI can reduce the supply risks (and reinforce the barriers to entry) and thus increase profits. The oligopolistic firm can also effect a horizontal DI to limit competition by acquiring control over a foreign rival.

This model has only been outlined by Hymer, several questions remaining unanswered. It explains the reasons inducing the firm to invest abroad but not the specific factors allowing it to do so. Why is it that firm *x* buys firm *y*, and not vice versa? If we are dealing with a national firm which – to be able to operate abroad – must overcome *C*, we must look for an *ex-ante* advantage also for this type of investment.

Hymer himself takes this problem into consideration when examining vertical DIs. He states that the nationality of the investor – whether, that is, the manufacturing firm acquires the raw material producer or vice versa – may depend on the characteristics of their respective managers, or on the difference between their sizes.

In the case of Type 2 horizontal expansion, instead, Hymer does not consider the reasons why the firm can expand its activities abroad. Here

Hymer seems to be thinking of examples in which *C* is not particularly important, therefore of international rather than national firms.

This is quite a different model relative to the previous one. The investments analyzed here are not made to use, via local production, advantages which could otherwise be exploited in the form of licensing or export. Here the firm invests abroad to create other advantages, for instance by strenghtening barriers to entry, thus increasing its own market power.

Type 3: Direct investment due to diversification. – Finally, the firm can also invest abroad, sometimes in different sectors relative to its own internal market, to diversify its activities and thus increase profits (Hymer, 1976, p. 40). The remarks made earlier on the unexplained reasons why the firm can invest abroad still hold. In this case too, one seems to be dealing more with an international than with a national firm.

In conclusion, Hymer's analysis concentrates on "active" firms. Following Bain's tradition, his firm has discretionary power and seeks to modify the structure of the market in which it operates to its advantage. The causation chain between market structure and the behaviour of the firm is not, therefore, unidirectional. Moreover, in his view, oligopoly is the market structure most likely to be associated with DI. He understands, however, that the relationship between concentration and direct investment is extremely complex (Hymer, 1976, p. 118).

This author provides a well-defined model of horizontal DI undertaken by a national firm (Type .1 DI) and two further models (Type 2 and 3) which are not fully convincing as explanation of the horizontal expansion of a national firm, but offer interesting starting points for an analysis of DI carried out by international firms.

The ambiguities present in Hymer's thesis called for further analysis aimed at explaining the effects that a transformation of the firm from national to international would have on the nature and values of *K* and *C*, thus on the forms that foreign operations would take. The importance of this transformation was certainly clear to Hymer, who concluded his thesis with the following words: "The fact of having international operations may lead firms to become international rather than national" (Hymer, 1976, p. 225).

We shall see how the path taken by subsequent writers was, unfortunately, considerably different.

3. *The Misconceptions of the Kindleberger Tradition*

The author who did most to divulge and popularize Hymer's ideas was his supervisor, Charles Kindleberger. One frequently hears – mistakenly, in my opinion – of a "Hymer-Kindleberger tradition" (Buckley and Casson, 1976; Buckley, 1985; Calvet, 1981; Sugden, 1983; Cowling and Sugden, 1987). Kindleberger offers an interpretation of Hymer's analysis which is not wholly accurate and, in some instances, wrong. We must analyze this in some detail as Kindleberger's views, thanks certainly to his well-deserved reputation, have been accepted rather acritically in the subsequent literature.

According to Kindleberger, Hymer's view was that DI belongs to the theory of monopolistic competition (Kindleberger, 1969, p. 32). As is well known, the characteristic features of "monopolistic competition" are: (i) a large number of firms making a differentiated product; (ii) free entry and (iii) absence of interdependence among producers. We saw that the whole of Hymer's analysis is centered on barriers to entry and oligopoly. Thus, unless one wants to re-define monopolistic competition, that type of market structure should be left out of any interpretation of Hymer. Even if one wishes to use a more appropriate term, such as imperfect competition and oligopoly, it is not at all clear how this would be compatible with the "monopolistic advantages" mentioned by Kindleberger.

This author does in fact shift the emphasis from oligopolistic– the most frequent determinant of Type 1 DI according to Hymer – to monopolistic advantages. He states that the firm, in order to invest, must possess an advantage "over existing or potentially competitive firms in that country" (Kindleberger, 1969, p. 12). In other words, over all firms operating at world level in that particular industry. From such a statement it follows that *a*) in every industry only one firm – the strongest – is in a position to invest abroad, and *b*) it becomes unnecessary to analyze the reactions and counter-reactions of firms operating in the same field.

Contrary to Hymer, Kindleberger does not indicate which type of firm his analysis refers to, nor which type of investment. In his writings therefore a model originally developed by Hymer to explain Type 1 DI – horizontal investment by national firms – is transformed into a general explanation.

Moreover, with a notable step backwards in relation to Hymer, Kindleberger fails to distinguish between *a*) firm specific *ex-ante* advantages allowing the firm to invest abroad, *b*) benefits deriving from internalization and *c*) reasons behind the decision to locate production in one country instead of another. Factors such as special marketing and technological skills, economies of scale and government intervention are lumped together

in the same category as sources of monopolistic advantages which allow the firm to invest abroad. Now, tariff and non-tariff barriers and other such interventions at governmental level can explain the choice between DI and export, and certainly not the reason why the firm can invest.

Economies of scale, on the other hand, can play various roles vis-à-vis foreign expansion, hence they need to be further qualified. Technical economies of scale (i.e. at the plant level) will result – *ceteris paribus* – in production being concentrated on one site, thus acting as a DI retarding, instead of inducing, factor. Economies of multiplant operations (i.e. at the firm level) arising from firm's specific abilities, like R&D, marketing, financial and managerial expertise, undoubtedly represent a reason why the firm can invest abroad. This, however, "is really a self-reinforcing combination of various other 'advantages' rather than a separate 'advantage' on its own" (Lall, 1976, p. 1335). Furthermore, economies of scale at the firm level originating from vertical integration achieved via DI, the type most referred to by Kindleberger, represent advantages which do not precede DI but are a result of it. Consequently they can explain why the firm wants to internalize the market and invest abroad, but not why it can do so and must therefore be held clearly a part from *ex-ante*, firm specific, advantages.

Kindleberger introduces a series of ambiguities which are still present in the literature. He does not draw a distinction between terms like monopoly advantage, monopolistic advantage, monopolistic competition and oligopoly. No distinction is made between the advantage preceding DI and those acquired through it. Lastly one of the key elements in Hymer's analysis is lost sight of, i.e. the necessity of specifying to what firm and to what type of DI the analysis refers to.

4. *The Eclectic Approach*

The various lines of research developed in the 1960's and 1970's were integrated by Dunning into a single interpretative scheme initially known as the "eclectic theory", and later defined as the "eclectic paradigm" (Dunning, 1979, 1981, 1988). According to this approach a firm will undertake a foreign direct investment if three conditions are satisfied: (i) the firm holds net ownership advantages vis-à-vis other producers in serving particular markets; (ii) it is profitable for the enterprise possessing these advantages to internalize their use by expanding its own operations rather than to turn to the market by selling them to other firms; (iii) it is remunerative to exploit

these advantages in association with "at least some factor input (including natural resources) outside its home country" (Dunning, 1979, p. 275).

The distinctive feature of this approach is that it acknowledges that, in order to explain a firm's expansion abroad, a whole set of questions must be answered, impinging on several branches of economic analysis, such as industrial economics, internalization theory and location theory. What must be explained is why the firm can invest abroad – i.e. the nature of its "ownership advantages" – and also why DI is chosen among all other means of exploiting those advantages. Dunning deserves full credit for this attempt to reassemble the different pieces into a comprehensive framework.

The logical structure of the eclectic reformulation resembles that of Hymer's Type 1 DI. However a scheme elaborated to explain horizontal DIs by national firms is extended by Dunning into a general DI theory, purporting to explain the horizontal and vertical integration of both national and international firms. "The eclectic theory suggests that *all forms* of international production by all countries can be explained by reference to the above conditions" (Dunning, 1979, p. 275, my emphasis).

Two sets of comments can be made here. Firstly, while Hymer's Type 1 model was partial, as it considered only one kind of DI, it nevertheless managed to identify some distinguishing features of the investing firm, and to explain the type of investment it made. The price paid for going "eclectic" is that of forfeiting the ability to single out which, in a long list of advantages, are crucial for a certain type of DI to be made by a certain type of firm. Dunning (1981, p. 33; 1988, p. 1) explicitly acknowledges this point.

Secondly, while Hymer's Type 1 model was logically consistent, Dunning's enlarged scheme contains some logical flaws. These are a consequence of his attempt to apply a static theory of direct investment by national firms to the case of international firms. The national enterprise must, by definition, face C when operating abroad. The mature multinational, on the other hand, does not have a clear cut national identity any more (Caves, 1982, p. 13). This implies that C tends to zero and K – an *ex-ante* advantage – is not a necessary condition for foreign investment any longer. In his effort to include international firms in the analysis, Dunning adds advantages stemming from multinationality (Dunning, 1979, p. 276; 1981, p. 27) to Hymer's list of *ex-ante* firm specific advantages and, by so doing, unduly stretches the intrinsic logic of the model [5].

[5] This point has been qualified in a more recent version of the eclectic approach. The ownership advantages are now subdivided in asset advantages (*Oa*), due to the ownership of particular unique intangible assets, and transactional advantages (*Ot*) which "stem from the capacity of the MNE... to capture the transactional benefits..." (Dunning, 1988 p. 2). The *Ot* category would thus seem to be largely formed by *ex-ante* advantages of a managerial kind.

Dunning's condition (ii) above makes sense only if *ex-ante* advantages are considered. *Ex-post* advantages, those accruing to the firm after and thanks to its internationalization, do not exist, by definition, when the decision to internalize the market is being taken, hence cannot be sold or leased.

Finally, Casson (1984) remarks that if advantages due to multinationality are sufficient to allow the firm to operate abroad, only Dunning's conditions (ii) and (iii) above are necessary for DI to take place. Dunning's advantages accruing from multinationality are, in fact, internalization advantages: they only come into existence as the market is internalized. It follows that ownership advantages being unnecessary, the eclectic theory as such is not a general theory.

Dunning himself recently has presented his approach no longer as a general theory but as a paradigm, the eclectic or OLI – ownership, locational, internalization – paradigm, which is compatible with different theoretical approaches. According to Cantwell (1988, p. 3) it is "an overall organizing paradigm" which may be most pertinent in explaining different kinds of international production.

5. *The Internalization Theory*

A general theory of the MNE developed in the late 1970s is the theory of internalization (Buckley and Casson, 1976; Rugman, 1981, 1986; Teece, 1986). This is a static resource allocation approach, centered on a *passive* firm, an enterprise whose strategy is wholly determined by the structure of the market, which draws on a tradition inaugurated by Coase (1937) and taken up by Williamson (1981, 1986) [6]. Markets and firms, according to these authors, are alternative modes of coordinating production (in Williamson's words, they represent an "alternative governance structure"). In order to explain the existence and size of firms one has to consider, on the one hand, the costs of effecting transactions in the open market (transaction costs) and, on the other, the costs of conducting and coordinating the same activities internally, i.e. within the firm (coordination costs). The analysis suggests that the firm, reacting to market imperfections, internalizes activities in order to economize on transaction costs. The process will continue up

[6] In this paper the transaction cost approach is not considered as separate from the internalization theory. Teece (1986, p. 23) suggests that these two approaches are "one in the same", as both consider the firm as a response to market failure. However they diverge in emphasis as the transaction school focuses not on the firm but on the individual transaction as the unit of analysis.

to the point where: "the costs of organizing an extra transaction within the firm become equal to the costs of carrying out the same transaction by means of an exchange on the open market or the costs of organizing in another firm" (Coase, 1937, p. 394). It is, in other words, a cost-minimization problem, demand being taken as given.

According to this approach, the MNE arises when, due to international market failures, there is a net benefit from placing activities located in different countries under a unified administrative control. The necessary conditions for a firm to invest abroad are two, namely the enjoyment of internalization and locational advantages (Casson, 1984; Caves, 1982). The benefits from internalization are not necessarily associated with the availability of an *ex-ante* firm specific advantage, as the case of economies of vertical integration and of advantages from transfer pricing demonstrate. "The internalization of the market for a monopolistic advantage is a special case of the internalization of a market in general" (Casson, 1984, p. 7).

With respect to previous theories the ordering of questions is altered. What is being asked is, first of all, why should the firm substitute itself to the market. The emphasis previously being put on barriers to internationalization (i.e. on *C*) and on the firm's specific ability to operate in a foreign market is discontinued. Hymer's stress on differences between home versus foreign production and investment gives way to a search for similarities between them. "The MNE ... is simply one subspecie of the multiplant firm" (Caves, 1982, p. 1).

This different emphasis might perhaps be explained as a result of the changes which took place since the 1960s. The increased level of firms' internationalization and international markets' integration, due to the progress in transport and communication, has lowered the value of *C*, the barriers to internationalization. Therefore, although this is never fully spelt out, the focus tends to be on international rather than national firms.

One merit of the theory of internalization is that it stresses continuities in the passage from the firm to the market, by drawing attention to the wide range of intermediate contractual forms available between those two extremes.

Unfortunately, not much progress has been made in the attempt to single out transaction and coordination costs associated with alternative institutional forms, explain their nature and development, and render them measurable entities (Buckley, 1985, p. 11; Casson, 1984, p. 12). The last is, indeed, one of the major drawbacks of the theory.

Furthermore, this approach substantially restates, albeit with a different terminology, conclusions already present in the previous literature.

True, for the first time it is clearly stated that *ex-ante* advantages do not always represent a necessary condition for DI to take place. However, Hymer's Type 2 and 3 investments anticipated this *in nuce*, and so did Dunning's observation on *ex-post* advantages being, in some cases, sufficient for operating abroad. And, as we saw earlier, such statements give rise to further questions. Firstly, is it possible to invest although $K = 0$, i.e. there is no *ex-ante* advantage relative to local producers, because C also tends to zero? If this is the case, what are the reasons? What kind of firms can invest having K equal to zero? Finally, are we really talking of a $K = 0$ or of something else, such as a type of advantage – for instance, financial – different from those usually taken into consideration?

A number of authors who applied transaction cost theory to the MNE do not accept – quite correctly – one of the central assumptions of the theory, thus implicitly questioning the overall validity of the approach. Williamson justifies the pivotal role assigned to transaction costs in the theory by his belief that the primary purpose of the firm is that of economizing on those costs (Williamson, 1981, p. 1538). The corporation, in his view, "is first and foremost an efficiency instrument" (Williamson, 1981, p. 1564). The same line of reasoning is taken by Rugman (1981, pp. 156-7). Other internalization theorists, however, think differently. Just like Williamson, they realize that firms expand both to economize on transaction costs, thus reacting to existing market imperfections, *and* to increase their market power, thus creating new market imperfections, but unlike Williamson they do not see the former objective as predominant. They tend to argue, therefore, that no general conclusion emerge about the MNE contribution to social efficiency (Casson, 1984; Kay, 1983). If this central assumption on the firm's behaviour is put aside, the stress on transaction costs intrinsic to the theory becomes less justified.

6. *Concluding Remarks*

Hymer developed a static model focusing on a specific type of DI – horizontal investment made by national companies –, centering his approach on an *active* firm, an enterprise whose conduct is meant to include behaviour designed to react upon and alter the elements of market structure. The eclectic approach, when formulated as a "general" theory, extended Hymer's model to explain, in a single interpretative framework, the vertical and horizontal foreign expansion both of national and of international companies. In this attempt, however, much of the model's internal consistency was

lost. In the late 1970's the internalization school aimed at producing another "general" theory of MNE, focusing on a *passive* firm, a company whose strategy is determined by the structure of the market. Its distinctive feature relative to the previous "general" approach rests on its treatment of barriers to internationalization, considered here as concerning not the totality of firms but only part of them. In so doing this approach gained in logical consistency, at the expense, however, of the relevance of the questions it tried to answer.

Prevailing MNE theory developed since Hymer's seminal work offers much in terms of improvements in definitions and of empirical testing of this author's concepts and hypotheses. However, some serious sources of confusion have also made their appearance. *Ex-ante* advantages – predating direct investment – and *ex-post* advantages – accruing to the firm after and thanks to direct investment – are lumped together. Monopolistic advantages have taken the place of oligopolistic ones. Most important, as stressed by Acocella (1988), the emphasis has been shifted from an active to a passive firm. Furthermore, the theory has remained static, the only attempt to introduce dynamics being represented by a product-life-cycle approach (Vernon, 1966), where the passage of time is measured in terms of modifications to the product, the firm remaining unchanged.

Most questions which only a dynamic theory could answer are still open. Can one identify "stages" in the multinationalization of firms? What kind of structural factors in the firm and the industry could allow us to identify those stages? How does C (the barriers to internationalization) change – and, consequently, the size of K (the *ex-ante* advantage) making the investment possible – in the course of the firm's development and in different historical periods, e.g. in the presence of changing transport and communication technology? Which types of advantages are more important in the various stages of the firm's development? What are the macro and micro variables determining changes in the prevailing forms of international operations over time?

The most promising theoretical approach to answer those questions seems to be that of Penrose (1959), centered on an active firm, rather than that of Coase (1937). The firm à-la Hymer, considered within an international industry, must be restored as the proper unit of analysis, and the concept of oligopolistic advantage must be brought back in the forefront. Such an approach has been recently applied in a study which analyzes, within an evolutionary framework, the technological competition between MNEs in an international industry (Cantwell, 1989) and in a work on the relationship

between growth and multinationality (Cantwell and Sanna Randaccio, 1989).

Furthermore, the two phases of the "national" and "international" firm introduced by Hymer could be considered as successive stages in the firm's growth. This might represent a starting point in the formulation of a model aimed at analyzing the characteristics of a firm's foreign expansion in each of these two stages, and the changes in those characteristics from one stage to the next. A few suggestions in this direction were advanced by Sanna Randaccio (1980).

This is undoubtedly a difficult path to take, drawing as it does on branches of economics – industrial organization theory and the theory of the growth of the firm – where many problems are still unresolved. It is there, however, that the most interesting answers are likely to be found.

REFERENCES

Acocella N., "Efficienza e strategia nel processo di multinazionalizzazione: verso una teoria piú generale", in N. Acocella and R. Schiattarella, eds., *Teorie dell'internazionalizzazione e realtà italiana*, Napoli: Liguori, 1988.

Buckley P.J., "A Critical View of Theories of the Multinational Enterprise", in P.J. Buckley and M.C. Casson, *The Economic Theory of the Multinational Enterprise*, London: MacMillan, 1985.

——, and Casson M.C., *The Future of the Multinational Enterprise*, London: MacMillan, 1976.

Calvet A., "A Synthesis of Foreign Direct Investment Theories and Theories of the Multinational Firm", *Journal of International Business Studies*, 1981, *12*, 43-60.

Cantwell J.A., "Theories of International Production", *University of Reading Discussion Paper in International Investment and Business Studies*, N. 122, 1988.

——, *Technological Innovation and Multinational Corporation*, Oxford: Basil Blackwell, 1989.

——, and Sanna Randaccio F., "Multinationality and Growth amongst the World's Largest Firms", *University of Reading Discussion Paper in International Investment and Business Studies*, N. 134, 1989.

Casson M., "General Theories of the Multinational Enterprise: A Critical Examination", *University of Reading Discussion Paper in International Investment and Business Studies*, N. 77, 1984.

Caves R.E., *Multinational Enterprise and Economic Analysis*, Cambridge: Cambridge University Press, 1982.

Coase R.E., "The Nature of the Firm", *Economica*, 1937, *4*, 386-405.

Cowling K. and Sugden R., *Transnational Monopoly Capitalism*, Brighton: Wheatsheaf, 1987.

DUNNING J.H., "Explaining Changing Patterns of International Production: In Defence of the Eclectic Theory", *Oxford Bulletin of Economics and Statistics*, 1979, *41*, 269-95.

——, *International Production and the Multinational Enterprise*, London: Allen & Unwin, 1981.

——, "The Eclectic Paradigm of International Production: An Update and a Reply to its Critics", *Journal of International Business Studies*, 1988, *19*, 1-31.

GRAY H.P., "Macroeconomic Theories of Foreign Direct Investment: An Assessment", in A.M. Rugman, ed., *New Theories of the Multinational Enterprise*, London: Croom Helm, 1982.

HIRSCH S., "An International Trade and Investment Theory of the Firm", *Oxford Economic Papers*, 1976, *28*, 258-69.

HYMER S.H., *The International Operations of National Firms: A Study of Direct Foreign Investment*, Cambridge, Mass.: MIT Press, 1976 (previously unpublished Doctoral Dissertation, 1960).

KAY N.M., "Multinational Enterprise: A Review Article", *Scottish Journal of Political Economy*, 1983, *30*, 304-12.

KINDLEBERGER C.P., *American Business Abroad*, New Haven, Conn.: Yale University Press, 1969.

LALL S., "Theories of Direct Foreign Investment and Multinational Behaviour", *Economic and Political Weekly*, 3/1976, *31*, 1331-47.

PENROSE E.T., *The Theory of the Growth of the Firm*, Oxford: Basil Blackwell, 1959.

RUGMAN A.M., *Inside the Multinationals: The Economics of Internal Markets*, London: Croom Helm, 1981.

——, "New Theories of the Multinational Enterprise: An Assessment of Internalization Theory", *Bulletin of Economic Research*, 1986, *38*, 101-18.

SANNA RANDACCIO F., "European Direct Investment in US Manufacturing", unpublished M. Litt. Thesis, University of Oxford, 1980.

SUGDEN R., "Why Transnational Corporations?", *Warwick Economic Research Papers*, N. 222, 1983.

TEECE D.J., "Transaction Cost Economics and the Multinational Enterprise", *Journal of Economic Behavior and Organization*, 1986, *7*, 21-45.

VERNON R., " International Investment and International Trade in the Product Cycle", *Quarterly Journal of Economics*, 1966, *80*, 190-207.

WILLIAMSON O.E., "The Modern Corporation: Origins, Evolution and Attributes", *Journal of Economic Literature*, 1981, *19*, 1537-68.

——, *Economic Organization: Firms, Markets and Policy Control*, Brighton: Wheatsheaf, 1986.

PRINCIPALI SVILUPPI NELLA TEORIA DELL'IMPRESA MULTINAZIONALE: UN ESAME CRITICO

Le principali teorie dell'impresa multinazionale vengono esaminate in chiave comparata, mettendo in evidenza quali differenze siano da attribuire a una diversa impostazione teorica e quali invece al tipo di questioni esaminate.

Una prima parte del lavoro analizza la tesi di dottorato di Hymer, in cui è possibile rinvenire apporti teorici poi ignorati nella letteratura successiva. Secondo questo autore per formulare una teoria dell'impresa multinazionale è necessario porre al centro dell'analisi l'impresa e l'industria – generalmente oligopolistica – considerata nel proprio contesto internazionale. L'impresa in esame è attiva poiché non solo la sua condotta è influenzata dalla struttura del mercato, ma a sua volta la influenza. Hymer presenta un modello statico ben definito dell'investimento diretto orizzontale di un'impresa 'nazionale' e altri due modelli (investimenti diretti per rimuovere conflitti e per diversificazione) che offrono spunti interessanti per analizzare l'espansione all'estero di un'impresa ormai 'internazionale'.

Vengono poi esaminati l'approccio eclettico e la teoria dell'internalizzazione. Si fa notare come l'attenzione sia ora centrata su un'impresa passiva e la teoria continui ad essere statica.

Si conclude sottolineando la necessità di porre nuovamente al centro dell'analisi l'impresa alla Hymer, considerata nel contesto dell'industria internazionale, e si sottolinea l'importanza del concetto di vantaggio oligopolistico. Si ritiene inoltre che le due fasi suggerite da Hymer, quella dell'impresa 'nazionale' e quella dell'impresa 'internazionale', possano rappresentare un punto di partenza interessante per la formulazione di un modello dinamico.

Rivista Internazionale di Scienze Economiche e Commerciali
Volume 38 (1991), N. 2, 169-192

SOCIO-ECONOMIC CORRELATES OF INFANT MORTALITY IN INDIA

by
JANDHYALA B.G. TILAK *

1. *Introduction*

There has been a significant decline of infant mortality in the countries of the world during the last two-three decades. India is no exception. In India it declined from 165 (per thousand live births) in 1960 to 140 in 1970, to 118 in 1980 and to 105 in 1985 (UNICEF, 1987). While this is the national average, there are significant variations across different states and regions in the country. In urban India the rate is only 62 in 1981, compared to 119 in rural India. More striking variations can be found across different states. For example, it is 37 in Kerala and 150 in Uttar Pradesh. Most striking inequalities can be noted between rural and urban areas in these states: it is 24 in urban Kerala and 157 in rural Uttar Pradesh. Many states have progressed reasonably well over the years. Yet inter-state variations do persist.

The present paper tries to analyze these variations among the major states in India on which data are readily available, with a view to identify proximate causes that could be subject to policy attack. The attempt is also confined to an analysis of socio-economic factors. Diseases and medical factors, however important they are, are not taken into account. More precisely we shall be concerned with economic, educational, health services

---

* National Institute of Educational Planning and Administration, New Delhi.

Without implicating for any of the errors that remain, the author acknowledges with gratitude the helpful comments received from Lawrence J. Lau and Susan Stout on an earlier version of the paper, the encouragement received from Dean Jamison and George Psacharopoulos and the cartographic help from P.N. Tyagi. The views expressed here are those of the author and should not necessarily be attributed to the World Bank where he was working when writing this paper.

and other factors. The following section is devoted to a brief analysis of rural urban variations in infant mortality in India. After a short review of earlier research in Section 3, we proceed in Section 4 to an analysis of correlates of infant mortality in India, including the relationship between literacy and infant mortality. The paper ends with a few concluding observations in Section 5.

2. *Rural Urban Disparities*

While there has been a significant decline in infant mortality in India, such a decline is not uniform across different states. Table 1 presents the readily available estimates of rates of infant mortality in 17 major states in India in 1964-65, 1974 and in 1981. In 1981 the infant mortality rate is the highest in Uttar Pradesh, second highest in Madhya Pradesh, and the lowest in Kerala. In Figure 1 we classify the states into five categories: (a) states with *very low* infant mortality rate (Kerala), (b) states with *low* level of mortality (Karnataka, Himachal Pradesh and Jammu & Kashmir), (c) states with *moderate* rate of infant mortality, ranging between 75-100 per thousand (Maharashtra, Punjab, Andhra Pradesh, West Bengal and Tamil Nadu), (d) states with *high* mortality, viz., Haryana, Assam, Rajasthan, Gujarat and Bihar, and (e) states with *very high* rates of infant mortality (Orissa, Madhya Pradesh and Uttar Pradesh). Further, a classification of the states by rates of decline of infant mortality over time (1974-81) also indicates that there are significant differences between several states in India, as shown in Figure 2. We note that the infant mortality rate in two states have indeed increased between 1974 and 1981. In Madhya Pradesh the rate has increased from an alarming rate of 137 per thousand (the third highest figure among the states) in 1974 to 142 in 1981, while in Gujarat it has increased from 109 to 116. In states like Haryana and Jammu & Kashmir, the rate of decline is quite small, less than 1% per annum. Only in Kerala where the infant mortality rate was very low, and in Himachal Pradesh one notices a significant decline.

Changes in infant mortality between 1964-65 and 1974 make comparisons more distressing. In quite a good number of states, viz., Andhra Pradesh, Assam, Gujarat, Jammu & Kashmir, Madhya Pradesh and Orissa, there was an all round deterioration in the situation, the rural as well as urban rates of infant mortality having increased significantly. In the other states, and the country as a whole, there had been a decline in urban areas, but a significant increase in rural areas, which is indicative of the well-

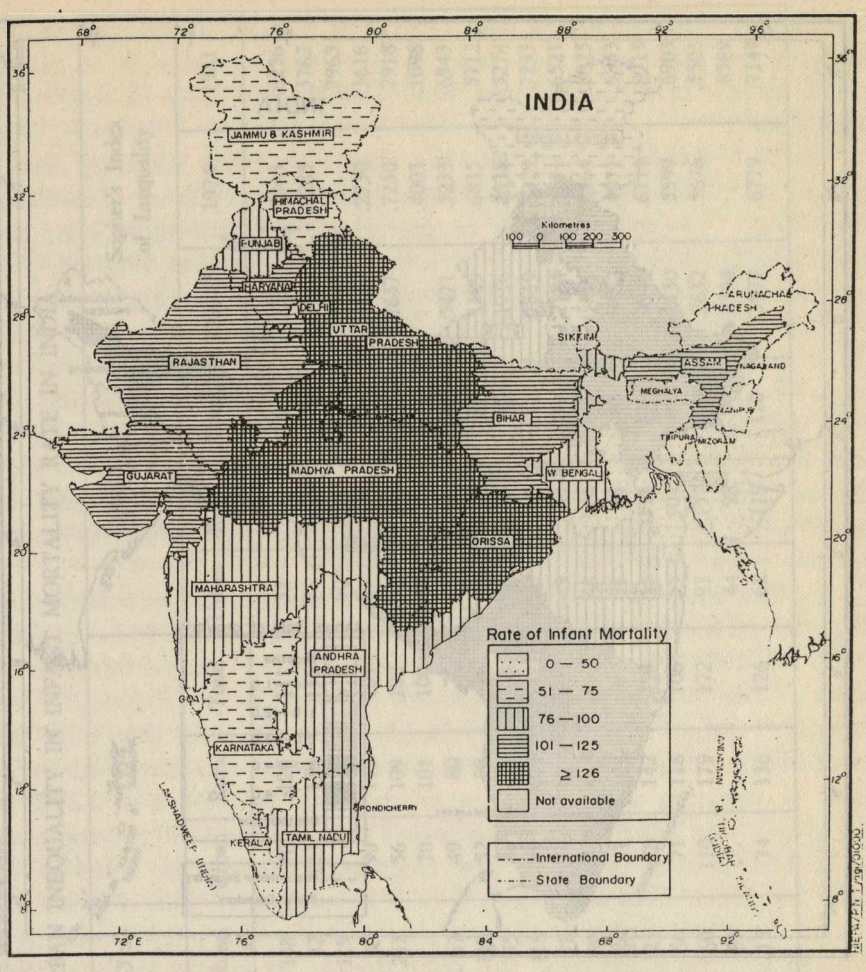


FIG. 1 Infant Mortality in India

known phenomenon of 'urban bias and rural neglect'. While in the later sections of the present paper an analysis of inter-state variations is attempted, in the remainder of this section we concentrate on rural-urban differences in infant mortality.

As already noted, rural urban disparities in infant mortality are quite high in India. In this section we propose to quantify the extent of such inequality in infant mortality between rural and urban areas in India by states. For such a binomial analysis of inequality, we have to select a

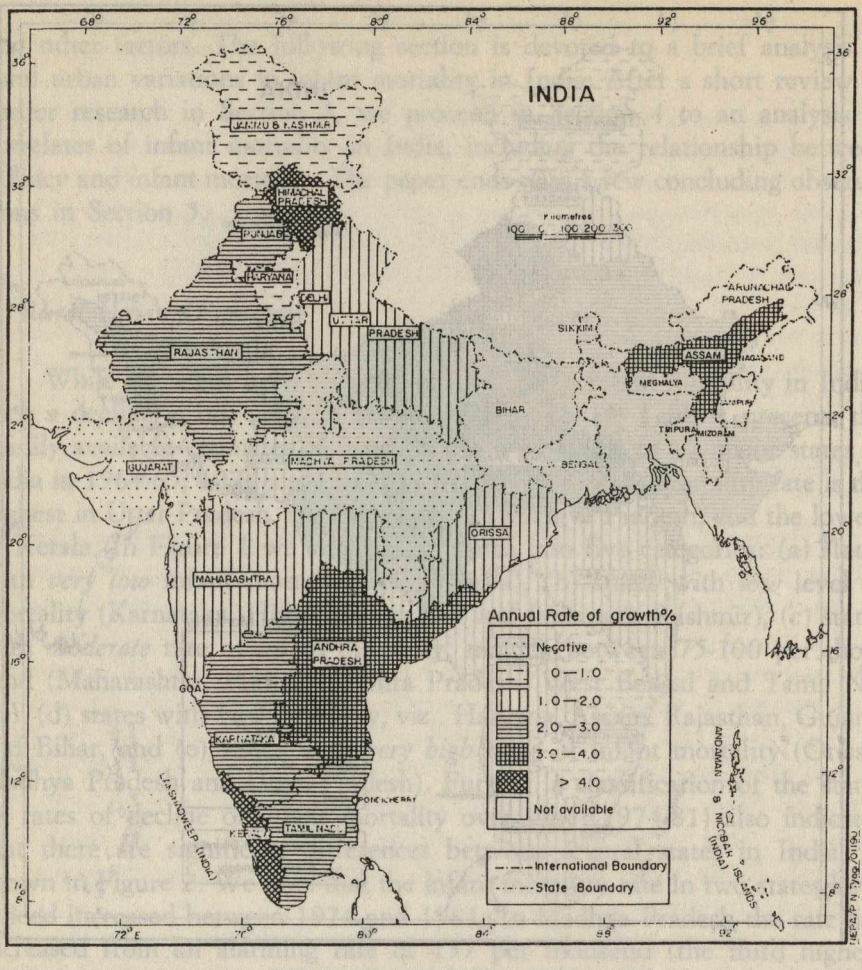


FIG. 2 Decline in Infant Mortality
(Annual Rate of growth %)

statistical measure of inequality among several available measures. A relatively recent proposed measure of inequality, known as Sopher's index (Sopher, 1974) is found to be highly useful whenever inequality is to be measured by a variable between two groups of population only, i.e., when inequality is to be measured between binomial elements. This index is also found to be satisfying a number of interesting axioms, such as the axiom of redistribution, axiom of repetitive transfers and axiom of multiplicative

TABLE 1

RURAL-URBAN INEQUALITY IN INFANT MORTALITY RATE IN INDIA

State	1964-65		1974			1981			Sopher's Index of Inequality		
	Urban	Rural	Urban	Rural	Total	Urban	Rural	Total	1964-65	1974	1981
1 Andhra Pradesh	66	108	70	120	111	52	93	86	.5316	.5943	.6256
2 Assam	58	82	113	138	136	76	107	106	.3631	.2285	.3762
3 Bihar	92	119	. .	. .	. .	60	124	118	.2924	. .	.7965
4 Gujarat	56	83	90	115	109	89	123	116	.4146	.2730	.3616
5 Haryana	83	243	56	109	102	52	108	101	1.2637	.7230	.7918
6 Himachal Pradesh	. .	. .	70	101	100	65	72	71	. .	.4005	.1098
7 Jammu & Kashmir	40	67	49	80	76	41	76	72	.5471	.5233	.6543
8 Karnataka	87	118	52	98	86	45	77	69	.3309	.6835	.5712
9 Kerala	46	55	44	56	54	24	40	37	.1916	.2538	.5274
10 Madhya Pradesh	72	118	83	145	137	80	152	142	.5339	.6279	.7233
11 Maharashtra	63	78	59	103	89	49	90	79	.2184	.6051	.6521
12 Orissa	63	90	75	155	150	68	140	135	.3861	.8164	.8025
13 Punjab	82	86	71	103	97	51	88	81	.0482	.4071	.5853
14 Rajasthan	111	121	78	142	133	53	118	108	.0945	.6711	.8715
15 Tamil Nadu	78	86	71	118	106	55	104	91	.1130	.5599	.6903
16 Uttar Pradesh	128	160	110	179	172	97	157	150	.2632	.5676	.5503
17 West Bengal	65	81	. .	. .	. .	44	98	91	.2334	. .	.8589
All India	80	115	74	136	126	62	119	110	.3977	.6779	.7147

Note: . . Not available
Source: See Appendix B (Table A.1).

monotonicity (see Kundu and Rao, 1986) [1]. It is especially because of these characteristics that the Sopher's index is used here even though, in general, several indices of inequality may yield qualitatively more or less similar conclusions [2].

Table 1 presents, along with the state-wise infant mortality rates in India by rural and urban areas, estimates of the Sopher's index of inequality in 1964-65, 1974 and 1981. It is clear from here that there exist large inequalities between rural and urban areas. As compared to 1964-65, when the infant mortality rate in rural India was only 40 per cent higher than that in urban India, in 1981 the infant mortality rate in rural India is almost double that in urban areas; and in states like West Bengal, Rajasthan and Orissa the ratio is still higher. It is important to note that not only the rural urban differences are high, but also they are increasing. Only in a very few states like Haryana and Gujarat there was a decline in the Sopher's index between 1964-65 and 1974, and in Himachal Pradesh and Karnataka during 1974-81. In most other states, the rural urban differences have been widening remarkably [3].

Further, inter- state variations in infant mortality have increased marginally (the coefficient of variation was 0.2760 in 1974 and it increased to 0.3015 by 1981). In 1981 the infant mortality rate ranged between the lowest 37 per thousand (Kerala) and the highest 150 per thousand (Uttar Pradesh). Further, somewhat surprisingly one may note that inter-state inequalities are higher in urban areas, compared to rural areas (the coefficient of variation was 0.3142 in urban areas in 1981 and 0.2909 in rural areas); and moreover both increased over the years from respectively 0.2788 and 0.2626 in 1974. The comparable figures for 1964-65 are 0.3067 for urban areas and a high 0.4239 in rural areas. This it seems that the significant improvement in inter-state variations in infant mortality is restricted to rural areas only. We shall attempt to analyze some of these inter-state variations in the remainder of the paper. Before we do so, a brief review of the earlier research may be in order.

---

[1] See Appendix A for details on the method of the Sopher's index of inequality.

[2] Particularly the rank orders may remain more or less the same. For instance, it can be noted that a simple differential index also yields highly similar rank order scores as that of Sopher's index (see e.g., TILAK, 1984).

[3] Inter-state variations in rural urban inequalities remained largely unchanged between 1974 and 1981, with the Spearman's rank order correlation coefficient being 0.8147 between the Sopher's index in 1974 and that in 1981.

3. *Earlier Research*

While in the early years a decline in death rates was found to be closely associated with economic growth, particularly in the advanced countries of the world (United Nations, 1953), later research suggested that the relative role of economic growth in mortality declines diminished in favor of health and sanitation measures (Davis, 1956; and Stolnitz, 1958); and more recent research suggests a similar decline in the role of economic growth in favor of education and other human capital variables (Caldwell, 1986). For instance, on data of 99 third world countries, Caldwell (1986) presented coefficients of correlation between mortality rates (infant mortality rate, and life expectancy at birth) and various socio-economic variables. He found that enrollment, particularly of females, in primary schools, percentage of wives practicing family planning, and enrollments in secondary schools, followed by health and nutrition variables like ratio of physicians to population, and calories in-take per capita, have higher correlation with mortality rates, whereas per capita income is the least important variable [4].

Classifying the world countries into thirteen regions, Cumper (1984) plotted a linear regression equation between GNP per capita and infant mortality rate in 1976. The coefficient of correlation between the two was as high as 0.89. Cumper (1984, p. 110) also estimated the coefficient of correlation between $\log_{10}$ IMR and 9 demographic, health, education and related variables, of which fertility rate was found to be highly related positively with infant mortality rate.

In some of the studies on life expectancy as well as on infant mortality, particularly when income per capita turned out to be not significant, the distribution of income was found to be important (see Cumper, 1984, p. 29; and Preston, 1980). Rodgers (1979) found in a study on 59 countries where several alternative specifications of regression equations were used, that income inequality, measured by the Gini coefficient influenced significantly the infant mortality rate. More importantly it was found that it is not simply the proportion of income of the lowest proportion of population, but the whole distribution of income that is important (see also Silber, 1982; and Gwatkin, 1984, pp. 45-49).

Hobcraft et al. (1984) in their analysis of variations in neonatal postneonatal, child, and infant mortality rates in a few selected African and Asian developing countries, attempted to explain the variations with the

[4] However, some cross-national studies (e.g., TILAK, 1987) also indicate that economic variables explain a significant proportion of variations in health (like expectancy of life), when used in quadratic equation models.

help of mother's education, and work status, husband's occupation, and education, and type of residence, and found mother's education to be the most important determinant [5].

In a recent study on child survival, Galway et al. (1987) described five sets of socio-economic factors (viz., education and literacy, health services, income and expenditure, food availability, and water supply and sanitation facilities and six sets of disease and other factors, viz., diarrheal diseases, vaccine preventable diseases, acute respiratory infection, malaria, malnutrition and high risk fertility behavior) that are probable causes of child mortality in the countries of the world.

Reviewing the vast amount of earlier research, Cochrane (1986) found that all the attempts that examined the relationship between levels of mortality and levels of development found a strong effect of education on mortality in developing countries. On average an additional year of mother's schooling was associated with a reduction in child mortality by 9 per thousand. Further, the multi-variate attempts made to determine if the relationship between mother's education and child mortality was the result of the fact that more educated women were in wealthier households, and were married to more educated men, found that it was not true: of the 9 per thousand effect, 6 per thousand was the result of the woman's own education and 3 per thousand was the effect of the fact that she was married to a more educated, higher income husband.

Research on determinants of variations in infant mortality in India is rather limited. Dyson and Moore (1983) grouping the main Indian States into two regions, the North and the South including the states in the East, found that the fact that the states in the South and the East are characterized by lower infant and child mortality relative to the state in the North can be attributed to lower autonomy of women in the northern kinship system. They argued that differences in kinship structure and female autonomy between the North and the South might influence patterns of child care, and hence child mortality (p. 50). They felt that it was possible due to the absence of modern health education and services.

Simmons and Bernstein (1982; also Simmons et al., 1978; 1980) basing on household level data in rural Uttar Pradesh in north India, analyzed separately the determinants of survival of male and female children in the neonatal and post-neonatal period. Besides finding strong relationship between mothers' education and child mortality in the post-neonatal period

[5] COCHRANE et al. (1980) presented a review of earlier research on the problem. A quick and short review of more recent research can be found in COCHRANE (1986). Some of the studies on determinants of life expectancy are reviewed in TILAK (1987).

(the relationship was stronger in the case of female children), the authors found strong sex differences in the determinants of mortality and that child survival was associated with whether or not a child of that sex was wanted by the parents. Further, the effects of education remained strong when variables like land ownership were controlled, suggesting that education was not necessarily a proxy for wealth.

Zachariah and Patel (1982) have analyzed household level data on infant mortality rates in Kerala in 1980 and found that economic variables like per capita expenditure, or total household expenditure and ownership of land are not important; nor facilities like water supply and toilet facilities have any influence on infant mortality. On the other hand, education of the mother and social factors like caste are the most important determinants of infant mortality, besides factors like birth status (single or twin), birth order and time of the birth [6].

In a comparative study of Kerala and West Bengal, Nag (1983, p. 895) argued that the lower mortality in Kerala owes mostly to its higher social development, reflected in the development of social services like education, health and transport and other public policy measures, and partly to its favorable environmental and hygienic conditions.

Jain (1985) in a more recent study on infant mortality in rural India in 1978, found that both medical and non-medical factors are important in explaining the variations in infant mortality. While poverty and women's literacy, two household level factors, together explain about 60% of the variations, medical care at birth and during the post-neonatal period explain about 64%. Accordingly Jain, while admitting that the difference between the two was not significant, argues in favor of improvement in medical factors as compared to household factors. He concludes: "It may therefore be possible to reduce the high level of infant mortality currently prevalent in many states in India by simple preventive medical interventions such as the administration of anti-tetanus vaccine to pregnant women, changes in birth practices, and vaccination of infants. Simultaneous improvements in women's education and general economic conditions of the household would enhance the effect of preventive medical interventions by making them more acceptable and by improving the use made of available medical services for curative purposes" (p. 424).

Panchamukhi (1987) in a study on human resource development in India found with the help of simple regression equations, strong influence

[6] Besides, ZACHARIAH and PATEL (1982) provide field level information on neonatal, child and infant mortality rates cross-tabulated by a variety of factors including mothers' schooling, caste, ownership of land, monthly household expenditure, and other facilities.

of literacy and primary education on infant mortality [7]. He also regressed infant mortality on primary enrollment ratios in 34 low income countries and observed that the relationship is strong in low income countries compared to advanced countries.

Visaria (1985) reviewed the available data on the level and trends in infant mortality and of the associated differentials between various major states in India over the years. She analysed in detail national and state level estimates of neonatal, post-neonatal and overall infant mortality rates by sex and rural urban residence. Her exhaustive review indicates that the environmental or exogenous factors are important. Access to health care and education and work status of women are major determinants of the survival of infants. Interestingly, on work status, Visaria found that the children born to rural women working in agriculture experienced lower infant mortality than those born to women working in other blue collar production activities, presumably because agriculture tends to be seasonal and permits flexibility in work (p. 1449).

4. *Present Analysis*

4.1. *Correlates of Infant Mortality.* – In the present analysis we propose to have another look at the problem with more recent data on major Indian states. With the help of simple correlation analysis the association between infant mortality and a variety of socio-economic, education, health and other indicators, is measured, and at the second stage an attempt is made to analyze causative relationship between literacy and infant mortality. Four sets of indicators relating to economic development, education, health and others, are used for the correlation analysis. The economic development indicators include state income (State Domestic Product, *SDP*) per capita, and indicators on poverty and distribution, viz., the Gini index of per capita consumer expenditure, and poverty ratio, defined as percentage proportion of population living below the poverty line. Educational indicators include literacy of the total population, rural population, and rural female population, percentage proportion of villages having access, within a reasonable distance, to primary, middle and secondary schools, and enrollment in school level education. Five variables taken into consideration to comprise a set of indicators on provision of health facilities, are: percentage proportion of villages having, within a reasonable distance, access to a dispensary, health

[7] See also TILAK (1989).

center, and hospital; number of hospitals per thousand sq. km of area, and population served per hospital bed. The following general development/infrastructure indicators are also considered: percentage number of villages having a drinking water facility within the village, percentage number of villages having electricity, percentage number of villages having access to public transport (a bus stop) within a distance of 2 km., percentage of urban population, percentage of working population, and percentage of population without houses. One may intuitively hypothesize that all these indicators are related to infant mortality: variables like provision of health services and drinking water facility may be the most important variables influencing infant mortality; literacy and education may have direct impact through better practices of child care, better methods of sanitation, etc., besides indirect effect on infant mortality through better use of health services; economic variables like income per capita and poverty may be deterministic factors of the whole behavior of the families; and other variables like urbanization, electricity and work force participation may be strongly or remotely related to infant mortality. Table A.1 in the Appendix gives a summary of the details on the variables, their notation, means, standard deviations, the sources of data, etc.

Table 2 presents coefficients of correlation between infant mortality and socio-economic, educational, health and other indicators described above. The coefficients for economic development indicators indicate that the more widely used growth indicator, viz., *SDP* per capita is very poorly related to infant mortality rate. This is not altogether surprising, given the earlier evidence. Kerala, which is one of the economically poorest states in India, has the lowest infant mortality rates, indicating that money cannot form a constraint in reducing infant mortality. According to the 19th round of National Sample Survey (NSS) infant mortality rate was the lowest in the lowest expenditure class and the highest in the highest expenditure class. All the NSS data in India since 1953-54 show such a 'perverse' relationship between mortality and expenditure. It was observed that in India in fact a positive relationship between infant mortality and per capita household expenditure may seem to be the general pattern (see Krishnaji, 1980). As Zachariah and Patel (1982, p. 22) argued, perhaps "per capita household expenditure does not appear to be a good measure of the economic status of a household for use in demographic analysis, particularly in mortality analysis".

We have noted that in earlier research where per capita income turned out to be not significant, income inequality and distribution aspects were found to be important. In the present case that is also not found to be valid.

TABLE 2

CORRELATES OF INFANT MORTALITY:
COEFFICIENTS OF CORRELATION IN *ALL* AND *RURAL* AREAS

	All	Rural Areas
Economic Development Indicators		
Y81	−.3211	−.2941
PR	.4689 *	.4687 *
PR_r	.4012 *	.4100
$GINI_r$	−.1330	−.0648
Educational Variables		
ENRL	−.6428 ***	−.6331 ***
LIT81	−.6551 ***	−.6448 ***
LIT_f	−.6972 ***	−.6946 ***
LIT_r	−.7219 ***	−.7391 ***
LIT_{rf}	−.7560 ***	−.7754 ***
PS	−.3731	−.3623
MS	−.6092 ***	−.6296 ***
SS	−.4474 *	−.4770 *
Health Variables		
DISP	−.6837 ***	−.7015 ***
HC	−.4351 *	−.4645 *
HOSP	−.4216 *	−.4362 *
HOSP/Area	−.5272 **	−.5335 **
BDS/Pop	.8255 ***	.8058 ***
Other Variables		
URB	−.2256	−.1375
WORK	.0400	.0866
WAT	.0100	.0283
EL	−.5975 **	−.5615 **
BUS	−.6964 ***	−.6976 ***
HOUS	.0447	.0245

Note: *** Significant at 1% level. ** Significant at 5% level. Significant at 10% level.

Gini index of inequality in consumption expenditure is also not significantly related with infant mortality rate, though the sign is negative; and the coefficient of correlation between infant mortality rate and poverty ratio is positive and only significant at the 10% level.

On the whole, we note that the economic variables, including distribution aspects are not very important in India in explaining variations in

infant mortality rate [8]. Now we turn to human capital and other variables, particularly education, health and infrastructure facilities. Let us note the results one by one.

The educational variables are the most significant variables in the whole set of variables considered here. The values of the coefficients are high, the signs are expected ones, and the level of significance is high. Enrollment of children in the schools (primary and secondary) is a good indicator of the level of educational development of a population. The higher the enrollment, the lower would be the mortality rate of infants. Rate of literacy, a stock variable, is a better measure of the level of education of the population. The value of the coefficient of correlation between literacy and infant mortality rate is as high as 0.66; and it is higher if the literacy rate of females (a proxy for mothers' education), is taken into account. Women's, particularly mothers', education obviously does influence child care [9]. Earlier research also indicated that in the simple bivariate comparisons of parental education and child survival, one finds virtually no deviation from the expected pattern. The more schooling the mother (or father) had, the lower the mortality of their children. Since the problem is more severe in rural areas, we also note that the literacy rate among rural women in India is most strongly related inversely with infant mortality rate.

Number of schools is also alternatively considered in this context and we find that number of primary schools and infant mortality rate are not significantly related; number of secondary schools and infant mortality rate are correlated (and the coefficient is significant at the 10% level); and the number of middle schools is more significantly correlated with infant mortality rate, suggesting probably that the middle level of education of 8 years is perhaps a threshold level of education which has an effect on infant mortality; education less than middle level has no significant effect and education after middle has a significant but small effect. The results relating to rural areas are exactly similar. Earlier research also indicated that "controlling for residence did not eliminate the effects of education" (see Cochrane, 1986, p. 1).

---

[8] Regression equations of infant mortality on State Domestic Product per capita, including first differentiation of the same, of the type attempted earlier (TILAK, 1987) did not produce any significant results in the present context.

[9] GALWAY et al. (1987, p. 46) found strong linear relationships between women's literacy and child mortality across countries. In a selection of countries, HOBCRAFT et al. (1984) have found a high relation between mothers' education and infant mortality. Infant mortality is high in the families with mothers having no education. SIMMONS and BERNSTEIN (1982) also found the same in India.

The other important set of variables relate to health. Accessibility to health services can have a decisive influence on infant mortality. We have considered the percentage number of villages having or having access within a distance of 2 km., to dispensaries and health centers and to hospitals within 5 km. distance, average area served by a hospital, and population served per hospital bed. All these are significantly correlated with infant mortality rate. The higher the quantum of these facilities, the lower the infant mortality. Of the four, number of dispensaries per population is the most significant variable. Further, we find high, positive and statistically highly significant correlation between population served per hospital bed and infant mortality rate in India. Further, it is true in rural areas as well.

Among the other variables that are considered here, work force as percent of population is least related to infant mortality rate, and urbanization is negatively, but not significantly related. The infrastructure facilities that are considered include water, electricity, public transport and housing. Somewhat surprisingly, even though more than 40,000 villages in India do not have drinking water facility within the village, this, viz., provision of drinking water facility lack of which is believed to be an important source of child disease or ill-health (see Briscoe et al., 1986), is not important at all in influencing mortality. Similarly housing is also not very important. The important facilities include provision of electricity, and transport (provision of access to a bus stop). In areas where public transportation is poor, the use of health facilities may drop off.

4.2. *Literacy and Infant Mortality.* – In short, we note from above that literacy and education variables exercise considerable influence on child care and thereby on mortality in India. In a sense, education is not just one of the variables, but the most important variable influencing infant mortality. Review of the earlier research made in Section 3 including besides India, other countries and cross national studies, strongly support this. The effects of education on infant mortality are varied. Educational status of the households may significantly influence the utilization of health care services. If infant mortality is a biological process, then the role of education may work largely through its influence on variables such as birth practices; on the other hand, if mortality is an outcome of a resource allocation process, then education may work by influencing the resource allocation process directly, the importance parents place on children, their health and well-being (see Simmons and Bernstein, 1982).

While we do not attempt to separate these influences, in this section, the total effect of education on infant mortality is analyzed using literacy as

TABLE 3

LITERACY AND INFANT MORTALITY, REGRESSION RESULTS

	Explained Variable	Explanatory Variable	Regression Coefficient (t-value)	Constant t-value	R^2	$\bar{R}^2$
1.	ln IMR81	ln LIT81	−0.8330 *** (3.498)	7.51 (8.76)	.4664	.4283
2.	ln IMR81	ln LIT71	−0.7064 *** (3.299)	6.90 (9.56)	.4205	.3819
3.	ln IMR74	ln LIT71	−0.5666 ** (2.779)	6.58 (9.53)	.3726	.3244
4.	ln IMR74	ln δ LIT81-71	−0.9322 ** (2.615)	6.37 (8.95)	.3282	.2803

Note: *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

the indicator of educational development. For this purpose, alternative forms of regression equations are used.

Only the results that turned out to be statistically significant are presented in the tables.

First, when a simple equation of the following type

$$\ln Y_t = \alpha + \beta \ln X_t + \varepsilon \qquad (1)$$

where Y refers to infant mortality rate, X the rate of literacy, t the time period, α the intercept term, β the regression coefficient, and ε the error term, is estimated, the regression coefficient is expectedly negative and statistically significant. The 'fit' is reasonably good (Eqn. 1 in Table 3), explaining 47% of the variations in infant mortality.

When a time lag was introduced in the above equation and an equation of the form

$$\ln Y_t = \alpha + \beta \ln X_{t-n} + \varepsilon \qquad (2)$$

is estimated, the values of the regression coefficient as well as R^2 diminished (Eqns. 2 and 3 in Table 3). Nevertheless they are also statistically highly significant.

Then, to examine whether infant mortality in period t is influenced by improvements in literacy overtime, the following equation is fitted

TABLE 4

LITERACY, HEALTH SERVICES AND INFANT MORTALITY

	Explained Variable	Explanatory Variable	Regression Coefficient (t-value)	Constant t-value	R^2	$\bar{R}^2$
1.	ln IMR81	LIT81	−0.0181 ** (2.916)	5.311 (25.08)	.5846	.5207
		HC	−0.0078 (1.202)			
2.	ln IMR81	LIT81	−0.0179 *** (3.178)	5.447 (25.98)	.6202	.5618
		HOSP	−0.0069 (1.674)			
3.	ln IMR81	LIT81	−0.0177 (1.637)	5.231 (15.51)	.5453	.4754
		H/Area	−0.0123 (0.446)			
4.	ln IMR81	LIT81	−0.0104 (1.459)	4.531 (10.81)	.6616	.6096
		BDS	0.0002 ** (2.176)			

Note: *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

$$\ln Y = \alpha + \beta \ln \delta X + \varepsilon \qquad (3)$$

where δ represents deviations (in literacy) overtime (literacy in 1981 *minus* literacy in 1971), and the resultant coefficient of regression is high in value, and statistically significant but at a lower level. In fact, the value of the regression coefficient (− 0.9322) is the highest of all the four equations; and the intercept term the lowest (Eqn. 4 in Table 3).

Thus all the three forms of regression equations of infant mortality on literacy confirm that literacy definitely reduces infant mortality in the immediate period as well as over the years; and hence improvements in literacy would be of significant use [10]. Literacy alone explains one-third to nearly half the variations in infant mortality in India.

[10] However, changes in literacy over time and changes in infant mortality are not highly correlated. Both linear and non-linear forms of regression equations of changes in infant mortality on changes in literacy turned out to be poor fits with statistically insignificant coefficients.

TABLE 5

LITERACY AND INFANT MORTALITY IN INDIA, 1981

States with			
Higher literacy and lower IMR	Lower literacy and higher IMR	Higher literacy and higher IMR	Lower literacy and lower IMR
Kerala Maharashtra Tamil Nadu Himachal Pradesh Karnataka Punjab West Bengal Haryana	Uttar Pradesh Madhya Pradesh Orissa Bihar	Gujarat	Jammu & Kashmir Andhra Pradesh Rajasthan

Note: 'Higher' and 'Lower' are in comparison with national average.

Further, when literacy is regressed along with variables on health provision, on infant mortality (see Table 4), the coefficients of determination improved significantly; but literacy is found to have relatively higher effect on infant mortality, with higher values of regression coefficients (and higher *t*-values) in general than variables on health. Thus it seems that among the policy options, improvement of literacy is to be preferred to provision of health facilities. But simultaneous improvement in the provision of health facilities would enhance the effect of literacy considerably. After all, improvement in general levels of literacy allows better utilization of existing health facilities, and may also produce demand for spread of the same.

Table 5 classifies the major states in India based on rates of literacy and infant mortality. The evidence from three fourths of the number of states fall into a systematic pattern: about half the number of states are characterized by higher (than national average) rates of literacy and lower (than national average) rates of infant mortality; and in four other states, rates of literacy are lower and infant mortality rates are higher. There are, however, four major exceptions. Gujarat which has a higher rate of literacy, also has a higher infant mortality; and Jammu and Kashmir, Andhra Pradesh and Rajasthan have lower rates of literacy and lower infant mortality rates, suggesting that in these states perhaps other factors are relatively

more important. For example, health services are relatively very poor in these states. Rajasthan ranks at the bottom among the states with respect to the percentage number of villages having a health center, and ranks fourth from the bottom with respect to percentage number of hospitals per 1000 sq. km., of area. Andhra Pradesh ranks fifth from the bottom with respect to percentage number of villages having access to a dispensary and to a health center; and so on. In Gujarat, factors other than socio-economic indicators, such as medical factors may be probably more important. Further analysis on these particular states may provide more insights into the problem.

5. *Conclusion*

That education influences infant mortality is a widely accepted view. But there are two strong versions of this view. One view is that education has a direct effect on infant mortality, as education transforms the parents in such a way that the well-being of the children is provided adequately. In addition, it may have indirect effect through interaction with other variables. In other words, the effect of education is significant independently of other variables. Alternatively it is argued that education is only a proxy for the socio-economic status of the family; at best it is only one of the several variables influencing mortality; its effect is only indirect and not independent of other factors; and it only interacts with other variables in influencing infant mortality.

In this overall background, this paper presents a modest attempt of an analysis of correlates of infant mortality in India. We started with a brief discussion on the increasing rural urban differences in infant mortality in major states in India. On the whole, while we note that the period between 1974-81 shows a marked improvement in infant mortality in India, in comparison with the preceding period of 1964-65 to 1974, still the rate of infant mortality is quite high in various states. Why some states are worse than other states with respect to infant survival? The present paper does not claim to be providing definitive answers to this question, but does provide some indicative insights into the problem.

Analyzing the correlates of infant mortality, a variety of indicators on socio-economic development, education, health and other development and infrastructure facilities are considered, all of which are believed to have some correlation with infant mortality. As Hobcraft et al. (1984, p. 219) note "interpretation of socio-economic differences in infant and child mortal-

ity and its components is never easy". In India, like in many other developing countries, we note high variations in infant mortality between rural and urban areas, the latter being relatively better off. With the help of simple correlation technique, it has been found here that literacy is the most dominant variable related to infant mortality. The second important set of indicators relate to provision of health facilities. Particularly economic development variables, including indicators of poverty and distribution, are not significantly related with infant mortality. Among the other variables, urbanization does not have a significant effect, even though we note significant variations in infant mortality between rural and urban areas. Somewhat surprisingly, but in conformity with some earlier research, provision of drinking water facility within the villages also does not have any impact on infant mortality. On the other hand, provision of electricity and access to public transport turned out to be significant variables. Even though coefficients of correlation were estimated separately for rural areas, we do not find much difference in the pattern of the relationship. With the help of simple regression analysis it is found that literacy alone explains one-third to nearly half the variations in infant mortality in India. Inclusion of variables on health services did improve the goodness of fit, with higher coefficients of determination; but of the two, relatively literacy is found to be having significantly higher influence on infant mortality. On the whole, the analysis tends to support the former hypothesis, referred to in the beginning of this section.

Nevertheless, the problem of infant mortality cannot be approached as a single cause phenomenon. As Mosley and Chen (1984, p. 41) rightly suggested, it should be studied more as a "chronic disease process with multi-factorial origins than as an acute, single cause phenomenon". The paper only tried to examine, of the several factors, the most dominant one that influences infant mortality in India and that seems to be education.

APPENDIX A: SOPHER'S INDEX OF INEQUALITY

In the literature, there exist several measures of inequality, both positive and normative. In a quantitative analysis one may prefer the positive measures to the normative ones, as the latter are based on individual value judgment and ethical norms and notions. Even among the positive measures it cannot be said that one is definitely superior to the other. Each has its own merits as well as its own defects. Among the several measures there are both absolute measures and relative ones. The absolute positive measures like range, mean deviation, quartile deviation, standard deviation and variance are simple to calculate, but are found to be not highly reliable ones. Same is the case with some of relative measures like mean deviation, relative quartile deviation, logarith-

mic standard deviation and even coefficient of variation, which are commonly and widely used. Relative measures like the Gini coefficient, Theil's Entropy measure and the Kuznets' index are found to be relatively sophisticated and very much reliable. Some of these measures are found to be more relevant when the distribution of the particular variable is between more than two groups of population [11]. Sopher's index, a relatively new measure of inequality, is one such index.

Sopher's Index, with marginal modifications in the present context, can be described as follows.

If X_1 and X_2 represent the respective values of the variable of groups 1 and 2, then the index of inequality, D, is given by the following equation:

$$D = \log (X_2/X_1) + \log [(Q - X_1)/(Q - X_2)] \qquad \text{Eqn. 1}$$

where $X_2 \geq X_1$ and $Q = 1000$.
This can also be written as follows:

$$D = \log (X_2/X_1) + \log (Y_1/Y_2) \qquad \text{Eqn. 2}$$

where X_1 and X_2 are rates of infant mortality of groups 1 and 2 respectively, and Y_1 and Y_2 are rates of 'infant survival' of the respective groups; and

$$X_1 + Y_1 = 1000, \text{ and}$$
$$X_2 + Y_2 = 1000.$$

It may be noted that if X_1 and X_2 interchange, the value of the index of inequality remains the same, but its sign changes, i.e., the value of the index between urban and rural, and that between rural and urban remain the same, but for the sign. Here we take X_2 as relating to rural areas and X_1 to urban areas, so that a positive value of the index denotes that inequality 'favors' the urban areas and is against rural areas; and vice versa [12].

Secondly, it is to be noted that the limits of the value of the index cannot be defined. However, if there is a situation of perfect equality, i.e., $X_1 = X_2$, the value of the index becomes zero; and if it is perfect inequality, i.e., X_1 or X_2 being zero, the index cannot be computed. Hence, finally it should be noted that the absolute value of the index of inequality has no meaning in itself. It is a relative index and therefore it will be useful only to compare temporal and spatial differences and differences across groups in inequality with reference to a particular variable, say infant mortality. In other words, to say, for example, the index of inequality between urban and rural regions in infant mortality in India is 0.6779 in 1974 has no meaning, unless we compare it with 0.7147 the similarly computed index for 1981.

---

[11] See SEN (1972) for a critical review of measures of inequality.

[12] It may be noted that if we are measuring inequality in infant survival, it may be needed that we take X_2 as relating to urban areas, and X_1 to rural areas, so that $X_2 \geq X_1$; and a positive value of the index denotes inequality in favor of urban areas.

APPENDIX B

TABLE A.1

SUMMARY OF THE DATA: NOTATION, MEAN, STANDARD DEVIATION, MINIMUM AND MAXIMUM VALUES OF THE VARIABLES

Variable	Definition	Mean	Std.Dev.	Min.	Max.
IMR_r65	Infant mortality rate, rural, 1964-65	105.88	44.89	55.26	243.38
IMR_u65	Infant mortality rate, urban, 1964-65	74.51	22.85	39.69	128.11
IMR74	Infant mortality rate, 1974	110.53	30.51	54.00	172.00
IMR81	Infant mortality rate, 1981	97.24	29.32	37.00	150.00
IMR_r	Infant mortality in rural areas, 1981	103.94	30.24	40.00	157.00
Y71	State Domestic Product per capita, 1970-71	643.76	170.36	402.00	1070.00
Y74	State Domestic Product per capita, 1973-74	637.47	173.97	381.00	1107.00
Y81	State Domestic Product per capita, 1980-81	1550.12	500.94	929.00	2760.00
$GINI_r$	Gini index of per capita consumer expenditures (rural), 1977-78	0.31	0.07	0.19	0.47
PR	Population below the poverty line (%), 1977-78	44.45	13.79	15.10	66.40
PR_r	Population below the poverty line in rural areas (%), 1977-78	44.94	14.75	11.90	69.00
LIT71	Rate of literacy (%), 1971	30.15	10.31	18.60	60.40
LIT81	Rate of literacy (%), 1981	37.72	11.65	24.40	70.40
LIT_r	Rate of literacy (%) rural, 1981	32.52	11.98	17.70	67.80
LIT_f	Rate of literacy (%) female, 1981	26.45	13.08	11.30	64.50
LIT_{rf}	Rate of literacy (%) rural female, 1981	21.73	13.73	5.40	63.00
PS	% no. of villages having a *primary* school within a distance of 2 Km., 1977	92.29	5.33	81.33	99.69
MS	% no. of villages having a *middle* school within a distance of 2 Km., 1977	49.79	16.53	25.71	98.56
SS	% no. of villages having a *secondary* school within a distance of 5 Km., 1977	58.23	20.99	20.21	96.71
ENRL	No. of students in primary and secondary schools per thousand population, 1979	186.18	35.70	142.00	266.00
DISP	% no. of villages having a dispensary within a distance of 2 Km., 1977	31.03	17.30	13.92	90.56
HC	% no. of villages having a health center within a distance of 2 Km., 1977	14.00	10.71	5.60	46.71
HOSP	% no. of villages having a hospital within a distance of 5 Km., 1977	37.68	15.95	14.63	78.43
H/Area	No. of hospitals per thousand sq. Km. of area, 1984	3.29	4.44	0.20	19.50
BDS	Population served per hospital bed, 1984	1677.35	765.90	576.00	3229.00
WAT	% no. of villages having a drinking water facility within village, 1977	87.00	21.91	9.08	99.39
EL	% no. of villages having electricity, 1977	48.39	32.15	9.15	99.78
BUS	% no. of villages having a bus stop within a distance of 2 Km., 1977	51.74	19.09	26.45	97.85
URB	% of urban population, 1981	21.72	8.06	7.70	35.00
WORK	% of working population, 1981	32.10	5.55	20.50	42.20
HOUS	% of rural population without houses, 1981	70.96	15.93	36.40	92.80

Sources of Data:
IMR65: *Statistical Profile of Children and Youth in India*, New Delhi: Institute of Economic and Marketing Research, 1972.
Y: *Quarterly Economic Report of the Indian Institute of Public Opinion*, No. 118. New Delhi.
GINI: RM Sundrum. *Growth and Income Distribution*, New Delhi: Sage, 1987.
ENRL, WORK: *The Economic Times' Statistical Survey of the Indian Economy 1984*. [Ed.: Hannan Esekiel/prepared and supervised by Kamla Suri and S. Gangadharan]. New Delhi: Vikas, 1984.
PS, MS, SS, DISP, HC, HOSP, WAT, EL, BUS: "Basic amenities in villages", *Economic and Political Weekly*. 20 (April 6, 1985), pp. 615-16.
Others: *Basic Statistics on State Economies in India*, 1986. Bombay: Commerce Research Bureau.

REFERENCES

BRISCOE J., SEACHEM R.G. and RAHAMAN M., *Evaluating Health Impact: Water Supply, Sanitation, and Hygiene Education*, New York: UNICEF, Dacca: International Center for Diarrhoeal Disease Research, and Ottawa: IDRC, 1986.

CALDWELL John C., "Education as a Factor in Mortality Decline", *Population Studies*, No. 3, 1979, *33*, 395-413.

——, "Routes to Low Mortality in Poor Countries", *Population and Development Review*, June 1986, *12*, 171-220.

COCHRANE Susan H., "The Effects of Education on Fertility and Mortality", Discussion Paper EDT 26, Education and Training Department, Washington D.C.: World Bank, 1986.

——, O'HARA Donald J. and LESLIE Joanne, "The Effects of Education on Health", World Bank Staff Working Paper No. 405, Washington D.C., 1980.

CRAMER James C., "Social Factors and Infant Mortality: Identifying High-Risk Groups and proximate Causes", *Demography*, August 1987, *24*, 299-321.

CUMPER G.E., *Determinants of Health Levels in Developing Countries*, New York: John Wiley, 1984.

DAVIS Kingsely, "The Amazing Decline of Mortality in Under-developed Areas", *American Economic Review*, 1956, *46*, 305-18.

DYSON Tim, "Levels, Trends, Differentials and Causes of Child Mortality – A Survey", *World Health Statistics Report 1977*, Geneva, 1977, 282-339.

—— and MOORE Mick, "On Kinship Structure, Female Autonomy, and Demographic Behavior in India", *Population and Development Review*, No. 1, 1983, *9*, 35-59.

GALWAY Katrina, WOLF Brent and STURGIS Richard, *Child Survival: Risks and the Road to Health*, Demographic Data for Development Project, Westinghouse: Institute for Resource Development, 1987.

GROSSMAN Michael and JACOBOWITZ Steven, "Variations in Infant Mortality Rates among Countries of the United States; The Role of Public Policies and Programs", in J. van der Gaag, W.B. Neeman and T. Tsukahara, Jr., eds., *Economics of Health Care*, New York: Praeger, 1982, 272-301.

GWATKIN Davidson, "Mortality Reduction, Fertility Decline, and Population Growth: Toward a More Relevant Assessment of the Relationship Among Them", World Bank Staff Working Paper No. 686, Washington D.C., 1984.

HOBCRAFT J., MCDONALD J.W. and RUTSTEIN S.O., "Socio-economic Factors in Infant and Child Mortality: A Cross-national Comparison", *Population Studies*, No. 2, 1984, *38*, 193-223.

JAIN A.K., "Determinants of Regional Variations in Infant Mortality in Rural India", *Population Studies*, 1985, *39*, 407-24.

KRISHNAJI N., "Poverty and Family Size", *Social Scientist*, Special Number: November 1980, 22-35.

KUNDU Amitabh and RAO J.M., "Inequality in Educational Development: Issues in Measurement, Changing Structure and its Socio-Economic Correlates with Special Reference to India", in *Educational Planning: A Long Term Perspective*, New Delhi: Concept for the National Institute of Educational Planning and Administration, 1986, 435-66.

MOSLEY Henry and CHEN Linclon C. (eds.), *Child Survival: Strategies for Research*, [*Population and Development Review*, a supplement to Vol. 10], New York: Population Council, 1984.

—— and ——, "An Analitical Framework for the Study of Child Survival in Developing Countries", in MOSLEY and CHEN (eds.), 1984, 25-45.

NAG Moni, "Impacts of Social Development on Mortality: Comparative Study of Kerala and West Bengal", *Economic and Political Weekly*, No. 19-21, Annual Number, 1983, *18*, 877-900.

PANCHAMUKHI P.R., "Leading Issues in Human Resource Development in India", in P.R. Brahmananda and V.R. Panchamukhi, eds., *The Development Process of the Indian Economy*, Bombay: Himalaya, 1987, 1060-1108.

PEBLEY Anne R. "Intervention Projects and the Study of Socioeconomic Determinants of Mortality", in MOSLEY and CHEN, (eds.), 1984, 281-305.

PRESTON Samuel H., "Causes and Consequences of Mortality. Declines in Less Developed Countries during the Twentieth Century", in R.A. Easterline, ed., *Population and Economic Change in Developing Countries*, NBER Conferences Report No. 30, Chicago: University of Chicago Press, 1980, 289-360.

—— and BHAT P.N.M., "New Evidence on Fertility and Mortality Trends in India", *Population and Development Review*, No. 3, September 1984, *10*, 481-503.

RODGERS G.B., "Income and Inequality as Determinants of Mortality: An International Cross-Section Analysis", *Population Studies*, No. 2, 1979, *33*, 343-51.

SCHULTZ T. Paul, "Studying the Impact of Household Economic and Community Variables on Child Mortality", in MOSLEY and CHEN (eds.), 1984, 215-35.

SEN A.K., *On Economic Inequality*, Delhi: Oxford, 1972.

SILBER Jacques, "Incorporating the Distribution of Income and the Duration of Life into a Measure of Economic Growth: Some New Suggestions", Discussion Paper No. 420, Economic Growth Center, Yale University, 1982.

SIMMONS George B. and BERNSTEIN Stan, "The Educational Status of Parents and Infant and Child Mortality in Rural North India", *Health Policy and Education*, No. 2, 1982, 349-67.

——, SMUCKER C., BERNSTEIN S. and JENSEN E., "Post-neonatal Mortality in Rural India: Implications of an Economic Model", Paper presented at the 1980 meeting of the American Public Health Association [Quoted in SIMMONS and BERNSTEIN, 1982].

——, SMUCKER C., MISRA B.D. and MAJUMDAR P., "Patterns and Causes of Infant Mortality in Rural Uttar Pradesh", *Journal of Tropical Pediatrics and Environmental Child Health*, 1978 [Quoted in SIMMONS and BERNSTEIN, 1982].

SOPHER D.K., "Measurement of Disparity", *The Professional Geographer*, No. 4, November 1974, *26*, 389-92.

STOCKWELL Edward G. and HUTCHINSON Bruce W., "A Note on Mortality Correlates of Economic Development", *Population Review*, January-December, 1975, *19*, 46-50.

STOLNITZ George J., "The Revolution of Death Control in Non-industrialized Countries", *Annals of the American Academy of Political and Social Sciences*, 1958, 316, 94-101.

TILAK Jandhyala B.G., "Urban Bias and Rural Neglect in Education: A Study on Rural-Urban Disparities in Education in Andhra Pradesh", *Margin*, No. 1, October 1984, *17*, 61-86.

——, "Economic Growth and Life Expectancy", Population, Health and Nutrition Division, Population and Human Resources Department, Washington D.C.: World Bank, 1987 (draft).

——, "Education and Basic Needs in India", in *Human Resource Development for Rural Development*, Bombay: Himalaya, 1989, 47-67.

UNICEF, *Statistics on Children in UNICEF Assisted Countries*, New York, 1987.

UNITED NATIONS, *The Determinants and Consequences of Population Trends*, New York, 1953.

VISARIA Leela, "Infant Mortality in India: Level, Trends and Determinants", *Economic and Political Weekly*, No. 32, 33, and 34, August 10, 17 and 24, 1985, *20*, 352-59; 1399-1405; and 1117-50.

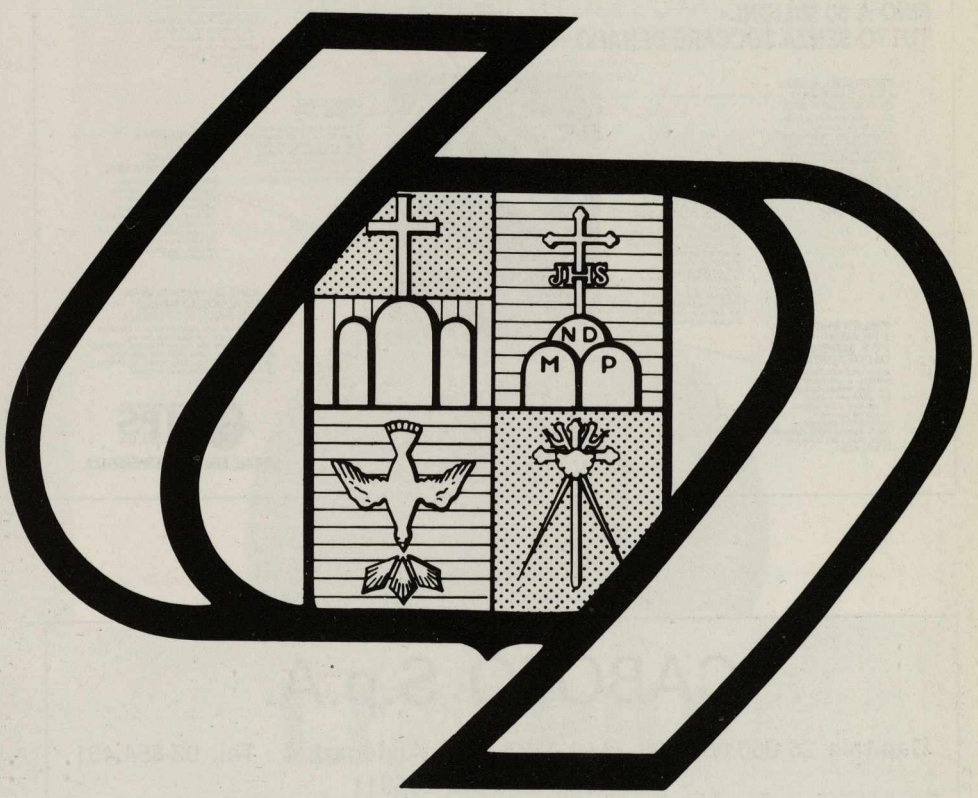
WARE Helen, "Effects of Maternal Education, Women's Roles and Child Care on Child Mortality", in MOSLEY and CHEN (eds.), 1984, 191-214.

ZACHARIAH K.C. and PATEL Sulekha, "Trends and Determinants of Infant and Child Mortality in Kerala", Discussion Paper No. 82-2. Population and Human Resources Division, Washington D.C.: World Bank, 1982 (mimeo).

CORRELAZIONI SOCIOECONOMICHE DELLA MORTALITÀ INFANTILE IN INDIA

Questo studio analizza la riduzione della mortalità infantile nell'India rurale e urbana nel tempo, esaminandone anche le diversità fra gli stati. Fra i vari indicatori dello sviluppo socio-economico – educazione, salute, infrastrutture e altri aspetti dello sviluppo che vengono qui esaminati –, il grado di alfabetizzazione risulta la variabile piú importante: da solo spiega da un terzo a un mezzo delle differenze nella mortalità infantile fra i diversi stati indiani. Questo suggerisce che l'istruzione ha un diretto e significativo effetto sulla mortalità infantile. La seconda serie di variabili in ordine di importanza è costituita dalla salute.

Al vostro fianco in Italia e nel mondo.



Se vi avvicinate al Banco di Napoli, scoprirete non solo una grande banca, ma soprattutto una grande rete di servizi. Oltre 500 sportelli in Italia e nel mondo, e terminali intelligenti in grado di gestire milioni di operazioni in tempo reale, ovunque voi siate. E ancora, una grande holding con società che operano in tutti i settori della finanza e dei servizi. E una presenza consolidata anche nell'area del credito a medio e lungo termine, a sostegno dell'agricoltura, dell'edilizia, dell'industria, delle opere pubbliche e dell'esportazione. Perché dal 1539 la nostra vocazione è quella di èsservi sempre vicini. In Italia e nel mondo.

BANCO di NAPOLI

BUENOS AIRES FRANCOFORTE HONG KONG LONDRA MADRID NEW YORK PARIGI
LUSSEMBURGO SOFIA BRUXELLES CAYMAN ISLANDS LOS ANGELES MOSCA ZURIGO

ADMARCO

DAL MONTE DEI PASCHI DI SIENA, CARTA MPS.

PER COMPRARE DOVE E COME VOLETE, CON IN PIÙ UN FIDO FINO A 30 MILIONI. TUTTO SENZA TOCCARE DENARO.

FIDO AGGIUNTIVO FINO A 30 MILIONI. OK CON "CARTA MPS".
Con Carta MPS potete richiedere un affidamento in conto corrente, aggiuntivo alla spendibilità della carta, di 5, 10, 20 o 30 milioni, a seconda delle vostre esigenze e disponibilità. E gli interessi passivi maturano solo dal momento dell'effettivo utilizzo del fido.

COSA È "CARTA MPS".
Carta MPS è la carta di credito di nuova generazione che, oltre a valere come denaro contante nella vita di tutti i giorni, assicura un numero elevato e crescente di vantaggi. Carta MPS vi dà la possibilità inoltre di usufruire degli stessi servizi supplementari che offre il sistema CartaSì: ad esempio le coperture assicurative contro il furto della merce acquistata e contro gli infortuni in viaggio.

RISCOSSIONE ASSEGNI FACILE E IMMEDIATA. OK CON "CARTA MPS".
Carta MPS è anche il vostro migliore documento di identità: per questo, oltre a consentire il cambio degli assegni MPS presso le oltre 500 filiali del Monte dei Paschi di Siena, in Italia e all'Estero, vi assicura sempre e comunque la più sollecita collaborazione da parte di tutto il nostro personale.

COMPRARE OVUNQUE E COMUNQUE. OK CON "CARTA MPS".
Con Carta MPS siete i benvenuti in oltre 200.000 tra negozi (dal supermercato al grande gioelliere) alberghi e ristoranti; è la più varia possibilità di utilizzo oggi presente in Italia, in più, grazie ai circuiti internazionali VISA e MASTERCARD cui aderisce, Carta MPS è accettata anche all'estero.

COME AVERE "CARTA MPS".
È presto detto: basta avere (o aprire) un conto corrente presso una delle oltre 500 filiali del Monte dei Paschi di Siena e richiedere Carta MPS. La concessione avviene entro pochi giorni.

INFORMAZIONI E OPERAZIONI SELF SERVICE. OK CON "CARTA MPS".
Meno code, discrezione assoluta, nessun possibile malinteso: la memoria elettronica della banca vi fornisce tutte le informazioni sul vostro conto corrente e vi consente di svolgere rapidamente un numero sempre maggiore di operazioni.

PRELIEVI BANCOMAT E PAGAMENTI P.O.S. BANCOMAT. OK CON "CARTA MPS".
Carta MPS può essere utilizzata anche come una comune tessera Bancomat, per effettuare prelievi di contanti e per pagare in tutti gli esercizi commerciali attrezzati con il sistema P.O.S. Bancomat (ogni giorno più numerosi in tutta Italia).

CARTA MPS COLLEGATA AL CIRCUITO INTERNAZIONALE VISA.

IL MONTE DEI PASCHI DI SIENA METTE AL VOSTRO SERVIZIO CINQUE SECOLI DI ESPERIENZA.
L'esperienza vale quando serve a produrre nuove idee, più vantaggiose per voi, più rispondenti alle nuove esigenze della vita di oggi. Come Carta MPS, per esempio. La prova del valore della nostra esperienza la troverete nella capacità di risolvere i vostri problemi.

5 CM. PER 8. DI CUI SARÀ DIFFICILE FARE A MENO.
Ora che sapete tutto di Carta MPS possiamo solo aggiungere che Carta MPS è il "sistema aperto" che vi assicurerà sempre più servizi, in tempo sempre più rapido e con sempre maggiore convenienza.

MONTE DEI PASCHI DI SIENA
MPS
BANCA DAL 1472

CINQUE SECOLI DI ESPERIENZA.

CABOTO S.p.A.

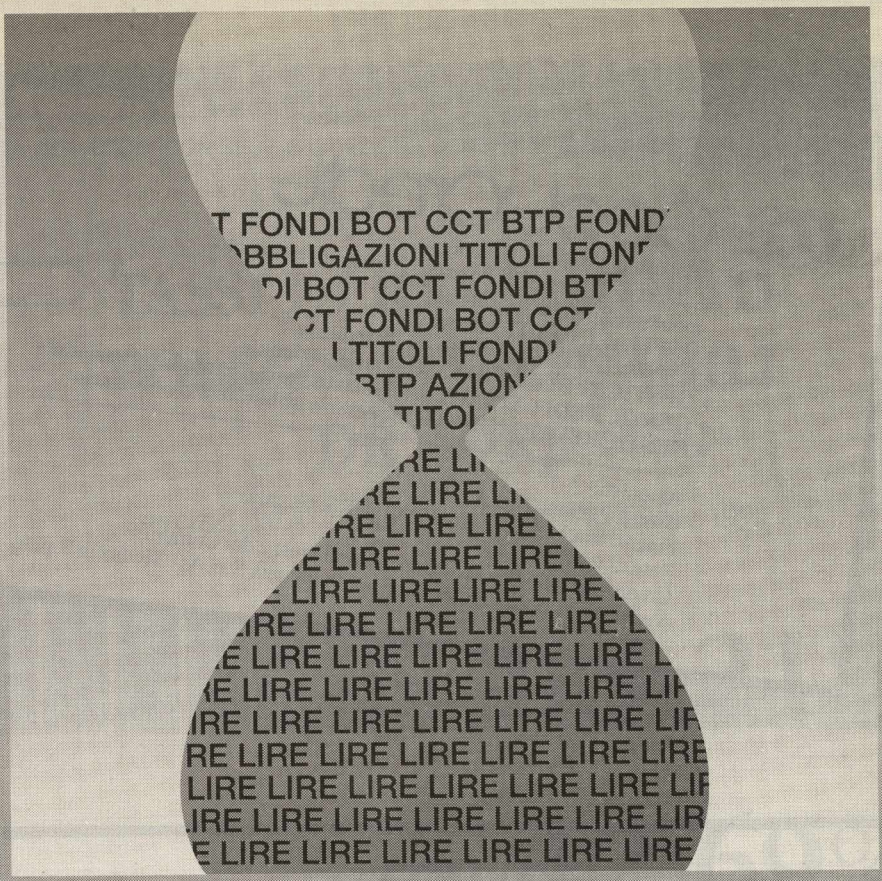
Capitale 25.000.000.000 - MILANO - Via Andegari, 4 - Tel. 02-864.451
Registro Società 255911

INTERMEDIAZIONE MONETARIA

- strumenti monetari (titoli di Stato, accettazioni bancarie)
- obbligazioni
- lira interbancaria
- programmi di calcolo per analisi di portafoglio

COMMISSIONARIA DI BORSA

- amministrazione patrimoni per clienti privati
- gestione della liquidità per aziende



LIREPIU'

IL CONTO INTELLIGENTE CHE RENDE PIU' ATTIVO IL DENARO

LIREPIU' è la nuova proposta CARIPLO per gestire in modo equilibrato ed intelligente le Vostre risorse finanziarie. Alla praticità ed alla comodità di un conto corrente, LIREPIU' aggiunge l'alto rendimento di un investimento in quote di un Fondo monetario. Il conto è CARIPLO, il Fondo è FONDIGEST. Investire e disinvestire diventano parole facili, anzi facilissime; il meccanismo flessibile del conto LIREPIU' investe automaticamente nel Fondo le somme eccedenti il normale fabbisogno di cassa e, se necessario, altrettanto automaticamente le disinveste per ripristinare la liquidità che vi serve. LIREPIU' offre così al vostro denaro un rendimento superiore ed, in più, ve ne assicura la piena disponibilità in ogni momento.

LIREPIU': liquidità più rendimento.

Per ogni altra informazione gli sportelli Cariplo ed il Servizio Finanziario Telefonico sono a vostra disposizione (tel. 02-8866.3939 tutti i giorni feriali dalle 8,30 alle 21).

CARIPLO

CASSA DI RISPARMIO DELLE PROVINCIE LOMBARDE

ALLEANZA ASSICURAZIONI

SOCIETÀ PER AZIONI CON SEDE E DIREZIONE GENERALE IN MILANO - VIALE LUIGI STURZO, 37

TASSI DI RENDIMENTO POLIZZE RIVALUTABILI DR - DRp

esercizio dal 1° novembre 1989 al 31 ottobre 1990

Gestione Fondo San Giorgio **13,21%**

Gestione globale titoli vincolati **12,69%**

- Questi risultati sono stati certificati dalla Società di Revisione Reconta Ernst & Young.
- La Compagnia riconferma agli Assicurati la partecipazione ai suddetti risultati nella misura dell'**80**%.

ALLEANZA
ASSICURAZIONI

ASSICURA E SEMPLIFICA LA VITA

International Monetary Fund *Staff Papers*

Staff Papers, a quarterly journal, contains studies by IMF staff on international monetary and financial issues. The articles in the December 1990 issue include:

Issues in Interest Rate Management and Liberalization . . Sergio P. Leite and V. Sundararajan

Interest Rate Policy in a Small Open Economy: The Predetermined Exchange Rates Case . . . . . Guillermo A. Calvo and Carlos A. Vegh

Economic and Monetary Integration and the Aggregate Demand for Money . . . . Jeroen J.M. Kremers and Timothy D. Lane

Valuation of Interest Payment Guarantees on Developing Country Debt . . . . . Eduardo Borensztein and George Pennacchi

Monetary Indexation and Revenues from Money Creation: The Case of Iceland . . . . . Peter K. Cornelius

Labor Market Segmentation in a Two-Sector Model of an Open Economy . . . . . Dimitri G. Demekas

The December issue also includes a shorter paper on the risk premium on Italian Government debt and comments on the relationship of government debt and interest rates.

ISSN 0020-8027

Price: US$35.00 for annual subscriptions; $10.00 for single issues.
(Annual rates are $17.50 for university faculty and students.)

Order from: Publication Services • Box No. E-585 • International Monetary Fund
700 19th Street, N.W. • Washington, D.C. 20431, U.S.A.
Tel. (202) 623-7430 • Fax (202) 623-7201

NEUTROMED pH 5.5 RISPETTA I TUOI VALORI.

DMB&B Bologna

La salute dei tuoi capelli dipende da quella del cuoio capelluto. Per restituire ai tuoi capelli tutta la loro naturale bellezza, usa Neutromed pH 5.5, lo shampoo dalla formula ipoallergenica e a valore fisiologico pH 5.5 che deterge delicatamente i capelli e ripristina l'equilibrio e le difese naturali del cuoio capelluto.

Neutromed pH5.5

Guaber

STUDI ECONOMICI E SOCIALI

Rivista di vita economica - Centro Studi « G. Toniolo »

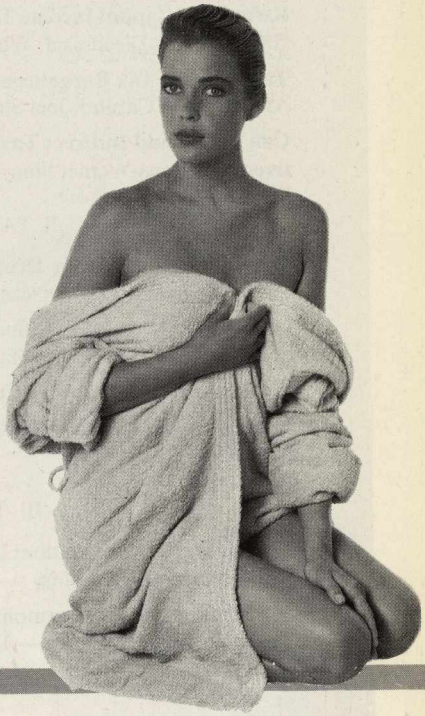
SOMMARIO DEL N. 4 - Ottobre-Dicembre 1990 - ANNO XXV

Direzione, redazione, amministrazione: Piazza G. Toniolo, 2, PISA.
Abbonamento annuale L. 42.000, estero, L. 70.000, c.c. postale n. 13420567, intestato a « Studi economici e Sociali », Piazza Toniolo, 2, Pisa.

INTERNATIONAL WORKSHOP

From 15.-17. July, 1991 the Institute of Statistics and Operation Research together with the Department of Social Policy at the University of Trento, Italy, is hosting an international workshop on statistical modelling and latent variables. Topics include models with error in variables, measurement models, latent structure models, path analysis, identification and indeterminacy problems, applications in social science, economics and psychology. Keynote speakers will be D.J. Bartholomew (London), P. Bentler (UCLA), D. Freedman (Berkeley), B. Flury (Bloomington), W.A. Fuller (Iowa), D. Rogosa (Stanford), K.G. Jöreskog (Uppsala), H. Schneeweiß (Munich). Information: Klaus Haagen, Istituto di Statistica e R.O., Università di Trento, Via Verdi 26, 38100 Trento, Italy. Fax (*39)-461-881499, or Hans Schadee, Dipartimento di Politica Sociale, Università di Trento, Via Verdi 26, 38100 Trento, Italy.
e-mail CONF91 @ ITNCISTI or SCHADEE @ ITNCISTI

NEUTROMED pH 5.5
RISPETTA
I TUOI VALORI.



Il pH 5.5 è il valore fisiologico della tua pelle, e ne costituisce la naturale protezione. Per mantenere inalterate e ripristinare le tue difese naturali, usa Neutromed pH 5.5, il bagnoschiuma dalla formula ipoallergenica che ha lo stesso valore fisiologico della tua pelle. La soffice schiuma di Neutromed pH 5.5 svolge una delicata azione detergente e igienizzante, favorendo l'ottimale idratazione cutanea e lasciando la pelle morbida e liscia.

Neutromed pH5.5

Guaber

DMB&B Bologna

Il futuro è nei nostri progetti quotidiani.

BANCA ANTONIANA
il futuro è oggi

CENTRO INTERUNIVERSITARIO PER LA TEORIA DEI GIOCHI E LE APPLICAZIONI

Secondo annuncio - *Call for papers*

Conferenza internazionale di Teoria dei Giochi

25-27 giugno 1991, Fiesole (Firenze)

Una Conferenza internazionale di Teoria dei Giochi, promossa dal Centro Interuniversitario per la Teoria dei Giochi e le applicazioni, e dall'Università di Firenze, si terrà a Firenze dal 25 al 27 giugno 1991. La Conferenza comprenderà lezioni introduttive a invito, saggi e comunicazioni sottoposti e accettati dal Comitato Scientifico. Il Comitato Scientifico prenderà in considerazione contributi in tutte le aree della teoria dei giochi e le discipline collegate.

Lezioni introduttive di: Kenneth Binmore, Alain Haurie, A.F. Kleimenov, Eric Maskin, Hervé Moulin, Ariel Rubinstein.

Comitato scientifico: Michael Bacharach, Kenneth Binmore, Steven Brams, David Gauthier, *Peter Hammond*, John Harsanyi, Alain Haurie, Alan Kirman, David Kreps, *Jean-Jacques Laffont*, Michael Maschler, Jean-François Mertens, *Fioravante Patrone*, Ariel Rubinstein, Andrei Subbotin, *Piero Tani*, *Stephanus Tijs*.

I nomi in corsivo compongono il **Comitato di presidenza** della Conferenza.

Sedi della Conferenza: Istituto Universitario Europeo, via Badia dei Roccettini 9, 50016 San Domenico di Fiesole, Firenze; Centro Studi C.I.S.L., via della Piazzola 71, 50133 Firenze.

Comitato organizzatore: A. Battinelli, A. Bellieri dei Belliera, V. Ferrante, G. Gozzi, M. Grillo, V. Guidi, A. Kirman, P.A. Mori, F. Patrone, L. Sacconi, P. Tani, L. Vannucci.

La Conferenza si terrà in lingua inglese. I lavori vanno sottoposti solo in versione finale e devono pervenire a Piero Tani entro il **31 dicembre 1990** all'indirizzo sotto indicato.

I moduli di inscrizione e di prenotazione alberghiera sono ottenibili al medesimo indirizzo. A causa del prevedibile affollamento estivo, è consigliabile prenotare l'albergo con notevole anticipo.

Piero Tani, Dipartimento di Scienze Economiche, Università di Firenze, via Curtatone 1, 50123 Firenze; tel.: 055/28.94.96; Fax 055/21.89.93.

videotel

Il primo servizio interattivo a sole 7000 lire al mese per avere 1500 servizi direttamente a casa vostra

Ecco alcuni esempi:

Per fare prenotazioni o acquisti senza muoversi da casa

Per conoscere nuovi amici

Per scoprire nuovi ristoranti

Per trovare l'idraulico più vicino

Se avete il telefono dovete avere VIDEOTEL,
un servizio telematico semplice ed economico, attivo attraverso la rete del telefono, per ricevere e trasmettere in tempo reale una ricca gamma di informazioni (oltre 1500 servizi!).
Il grande vantaggio di Videotel è l'interattività. Videotel, infatti, fornisce non solo informazioni ma consente di dialogare in diretta con altri utenti e, se necessario, anche di stampare le pagine video.
Videotel è anche economico: noleggiare il Videotel costa solo 7000 lire al mese, si ritira presso gli uffici Sip o lo si può richiedere direttamente al 187.

videotel SIP

FACILE DA USARE MERAVIGLIOSO DA SCOPRIRE

GRUPPO IRI-STET

IL PENSIERO ECONOMICO MODERNO

SOMMARIO DEL N. 4 -1990 (Ottobre-Dicembre)

Direzione, redazione, amministrazione, Via della Fortezza, I, Pisa - Redazione di Roma, Via V. Veneto, 89 - Redazione di Napoli, P.zza Teatro San Ferdinando, 8 - Redazione di Verona, Piazza S. Maria in Solaro, 1

CALL FOR PAPERS

INTERNATIONAL CONFERENCE ON "MERGERS, COOPERATIVE AGREEMENTS, MARKETS AND PUBLIC POLICY"

(Bocconi University, Milan - 10-11/5/1991)

PRELIMINARY PROGRAM

PLENARY SESSION

Mueller Dennis (University of Maryland): Mergers: Theory and Evidence
Cowling Keith (University of Warwick): Monopoly Power and Public Policy

SESSION A - MERGERS AND COOPERATIVE AGREEMENTS

Smiley Robert (University of California at Davis): Merger Activity in the United States
Suzumura Kotaro (Hitotsubashi University): Mergers Activity and Public Policy in Japan
Veljanovski Cento (IEA): U.K. Mergers and Privatization Policy

SESSION B - MARKETS AND PUBLIC POLICY

Jenny Frederic (ESSEC): Evolution of Antitrust Policies in France
Neumann Manfred (Universitaet Erlangen-Nuernberg): Competition Policies in the Federal Republic of Germany
Pappalardo Aurelio (European Commission): Evolution of E.C. anti-trust policies

SICURAMENTE SAI QUANTO SIA IMPORTANTE DIVERSIFICARE I TUOI INVESTIMENTI

GENERCOMIT TI OFFRE OGGI LA COMPETENZA PER DIVERSIFICARE, AL MEGLIO, I TUOI INVESTIMENTI NELLE BORSE PIU' IMPORTANTI DI TUTTO IL MONDO

Un investitore attento come sei tu, conosce sicuramente l'importanza della diversificazione degli investimenti, perché solo così si possono realmente cogliere le migliori opportunità che il mercato azionario può offrire. Con i Fondi Comuni d'Investimento GENERCOMIT sarete i benvenuti nei più importanti mercati azionari del mondo. GENERCOMIT vi offre infatti la grande occasione per diversificare il vostro investimento all'estero alla ricerca delle migliori opportunità che si possono verificare nelle più importanti Borse internazionali.

GENERCOMIT INTERNAZIONALE un Fondo che investe prevalentemente in Titoli azionari, che offre il vantaggio della dinamicità e flessibilità dell'investimento internazionale, riducendone il rischio.

GENERCOMIT NORDAMERICA e GENERCOMIT EUROPA investono prevalentemente in Titoli azionari quotati negli USA, in Canada e nei più importanti Paesi europei, consentendo di cogliere opportunità proiettate sulle singole realtà territoriali. E in più, con GENERCOMIT sarete sempre protagonisti del vostro investimento. Quando lo riterrete più opportuno, potrete infatti trasferire tutto o parte del vostro capitale da un Fondo all'altro, o parcheggiare il vostro investimento nel Fondo GENERCOMIT MONETARIO, senza pagare nuove commisioni di sottoscrizione. Questi Fondi Internazionali sono gestiti direttamente da GENERCOMIT Gestione che, a proprio carico, si avvale della consulenza di **FIDELITY INTERNATIONAL LTD.**, una tra le più grandi Società Private di gestione di Fondi d'Investimento presente con una rete di uffici su tutte le Borse mondiali.

Ma non è tutto! I FONDI INTERNAZIONALI GENERCOMIT offrono, inoltre, ai propri sottoscrittori, un'Assicurazione gratuita: un'indennità per ogni giorno di degenza in ospedale a seguito di infortunio.

Un beneficio senza nessun costo aggiuntivo.

Per ulteriori informazioni potrete rivolgervi agli sportelli della Banca Commerciale Italiana, della Banca di Legnano, del Banco di Chiavari e della Riviera Ligure, presso le Agenzie delle Assicurazioni Generali e della Fincral, nonchè ai Consulenti Finanziari GENERCOMIT.

I FONDI INTERNAZIONALI GENERCOMIT sono una inziativa comune della Banca Commerciale Italiana e delle Assicurazioni Generali.

FONDI COMUNI D'INVESTIMENTO

GenerComit

INTERNAZIONALE

NORDAMERICA

EUROPA

GenerComit

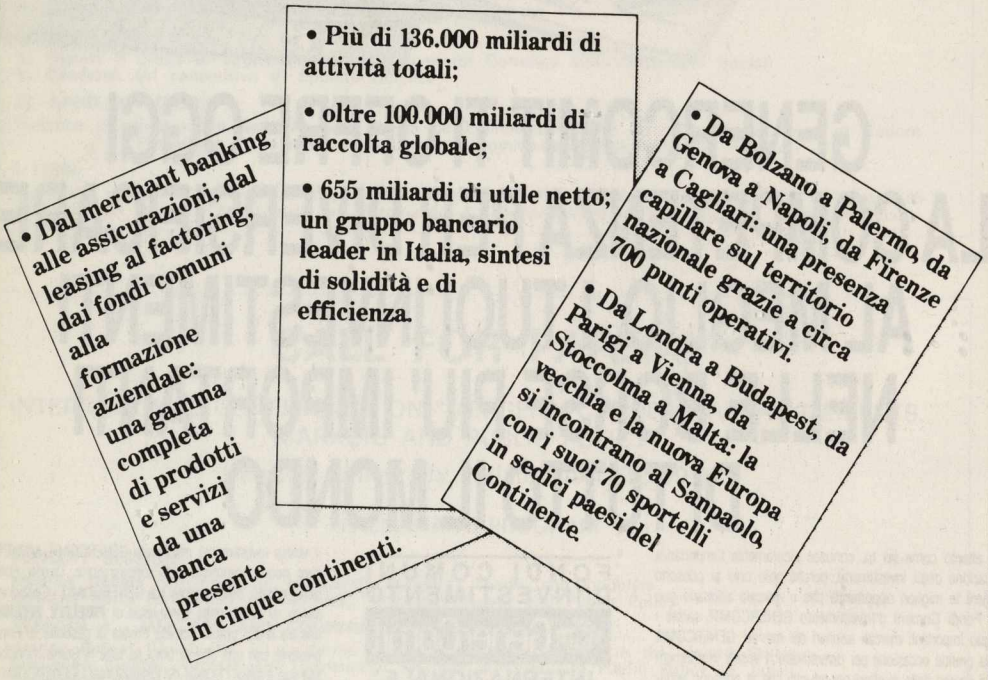
...nelle migliori borse del mondo

BANCA COMMERCIALE ITALIANA

GENERALI

GENERA Assicurazioni Generali

Sanpaolo: the most European Italian bank



GRUPPO SANPAOLO

Per essere un leader europeo ci vogliono basi solide.
Quelle del Sanpaolo, ad esempio.